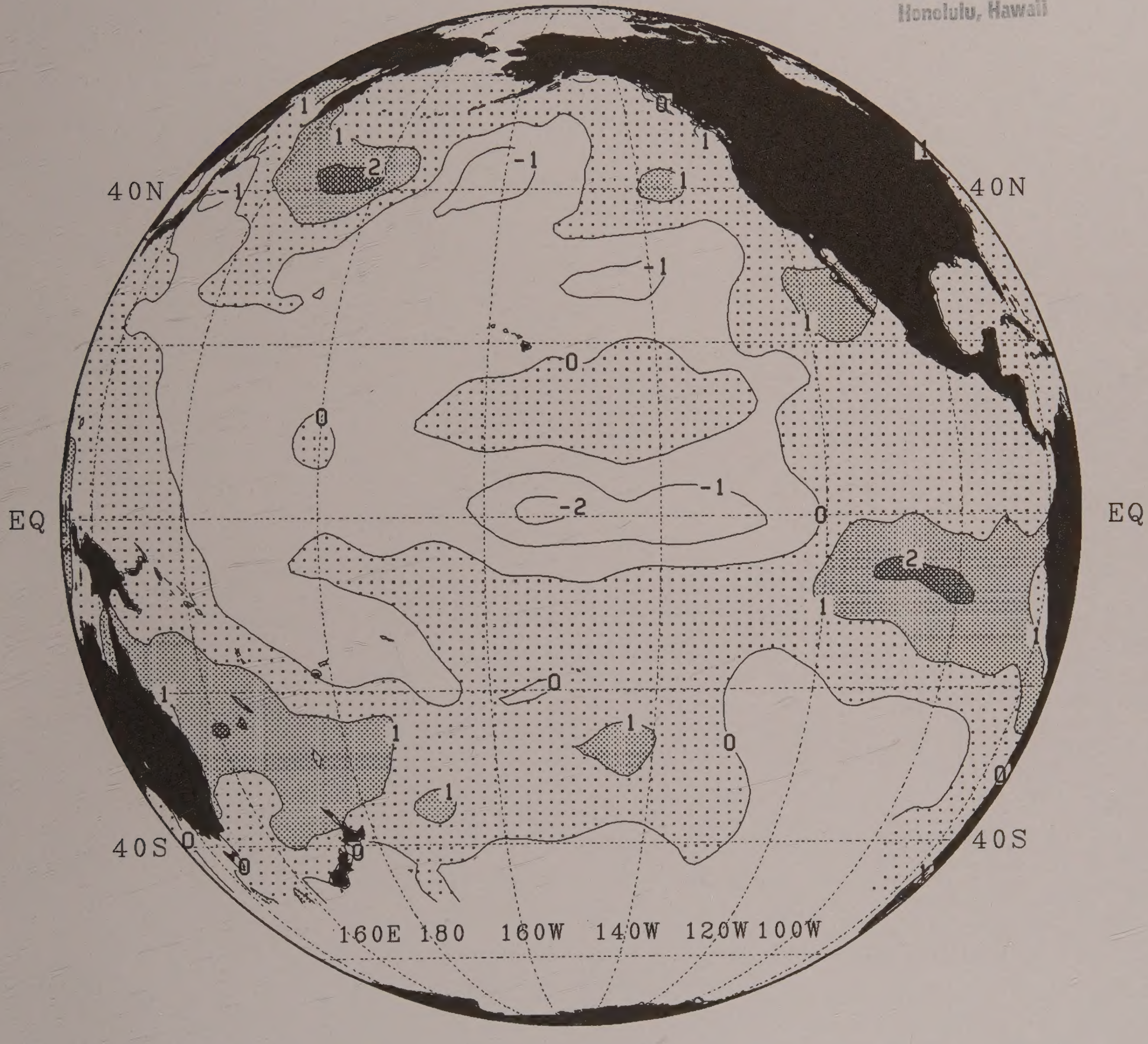
気象庁海洋月報

Monthly Ocean Report
August 1998 (No. 68)



Climate and Marine Department
Japan Meteorological Agency

気象庁 気候・海洋気象部

平成10年8月

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海況の特徴（１９９８年８月）

日本近海の海況

海面水温は，九州から紀伊半島の南と東シナ海で平年より0.5℃以上高かった。日本海中部及び三陸沖では平年より１℃以上低かった（第4図）。

黒潮は，九州から紀伊半島にかけて接岸した後，離岸して南東に流れ，上・中旬は八丈島の南で，下旬は八丈島付近で北に向きを変え，房総半島沖を東に流れていた（第9図）。

親潮系の冷水の沿岸寄りの分枝は38.8゜N, 143.0゜Eまで，沖合の分枝は37.1゜N，145.0゜Eまで，それぞれ達していた（第5図）。

太平洋の海況

太平洋赤道域の海面水温は，120゜W以東で平年より１℃以上高く，160゜Wから120゜Wにかけて-１℃以下の負偏差域が見られた。150゜E以西では平年より0.5℃以上高かった。

北太平洋では，40゜Nに沿って，160゜Eから170゜Wにかけてと135゜W付近で+1℃以上の正偏差域が，170゜Wから160゜Wでは-１℃以下の負偏差域が見られた。20゜N～30゜Nの日付変更線から130゜Wにかけては平年より0.5℃以上低く，カリフォルニア半島沖では平年より１℃以上高かった（第16図）。

Highlights August 1998

Seas adjacent to Japan

Positive SST anomalies exceeding +0.5°C were found from south of Kyushu to south of the Kii Peninsula and in the East China Sea. SSTs were more than 1°C below normal in the central Japan Sea and off Sanriku (Fig. 4).

The Kuroshio flowed along the coasts from Kyushu to the Kii Peninsula, then flowed southeastward. It turned northward south of Hachijo Island in the first and second 10-days of the month, and turned northward near Hachijo Island in the last 10-day, respectively. It then flowed eastward off the Boso Peninsula (Fig. 9).

Coastal and off-coastal branches of the Oyashio cold water extended southward to 38.8°N, 143.0°E and 37.1°N, 145.0°E, respectively (Fig. 5).

Pacific Ocean

In the equatorial Pacific, positive SST anomalies exceeding +1°C were found east of 120°W. Negative SST anomalies exceeding -1°C were observed from 160°W to 120°W. Positive SST anomalies exceeding +0.5°C were found west of 150°E.

In the North Pacific, positive SST anomalies exceeding +1°C were found from 160°E to 170°W and around 135°W along 40°N, while negative SST anomalies exceeding -1°C were observed from 170°W to 160°W. Negative SST anomalies exceeding -0.5°C were found from the date line to 130°W between 20°N and 30°N. SSTs were more than 1°C above normal off Baja California (Fig. 16).

日本海固有水の長期変動について－その３．栄養塩

Long-term Variation of the Japan Sea Proper Water － Part 3. Nutrients

日本海固有水の長期変動について、その１（本月報 No. 64）でポテンシャル水温の、その２（No. 65）で溶在酸素量の長期変動を示した。さらに今回は、1972 年から 1996 年までの観測データを使って、観測点 P（図 A）の日本海固有水における栄養塩の長期変動を示す。

日本海の深層における栄養塩濃度は、太平洋よりむしろ大西洋に近い値をしており、リン酸塩で 2.0 μmol/*l* 前後、硝酸塩で 20～30 μmol/*l* と比較的低い。これは、有機態のリンや窒素が分解され、無機態として蓄積した栄養塩が相対的に少ないことを示唆し、AOU（見かけの酸素消費量）が小さいことと併せ、日本海の鉛直海水循環のサイクルが早いことをうかがわせる。

点 P における栄養塩の長期変動の例として 1200 m 深と 2500 m 深の硝酸塩濃度の 1972 年からの時系列（図 B）を示す。どちらの層でも濃度の上昇傾向がみられ、25 年間の変動量は 1200 m 深で 3.7 μmol/*l*、2500 m 深で 4.0 μmol/*l* であった。この上昇はその２で示した溶在酸素量の長期減少傾向と符合し、要因として新たな日本海固有水の補給減少や酸化による栄養塩形成が挙げられる。

On the long-term variation of the Japan Sea Proper Water (JSPW), the potential temperature and dissolved oxygen were mentioned in Part 1 (No. 64 of this Report) and Part 2 (No. 65), respectively. Furthermore, we analyzed the long-term variation of nutrients within the JSPW by using observed data from 1972 through 1996 at the Station P (Fig. A).

The nutrients concentrations of the deep water in the Japan Sea are similar to those in the Atlantic Ocean rather than in the Pacific Ocean, that is, nutrients concentrations are relatively low, *e.g.* phosphate concentration is about 2.0 μmol/*l* and nitrate concentration is 20～30 μmol/*l*. It suggests that in the Japan Sea, the degradation of organic matter in deep water is suppressed and the cycle of vertical seawater circulation is fast, consistent with the fact that the AOU (apparent oxygen utilization) is small in the JSPW.

Time series of nitrate concentration at the depths of 1200 m and 2500 m are shown in Fig. B, and the increase rate for 25 years are 3.7 μmol/*l* and 4.0 μmol/*l*, respectively. This feature coincides with the long-term decrease in dissolved oxygen reported in Part 2 and may arise from the decrease of new replenishment of the JSPW or enhanced regeneration of nutrients.

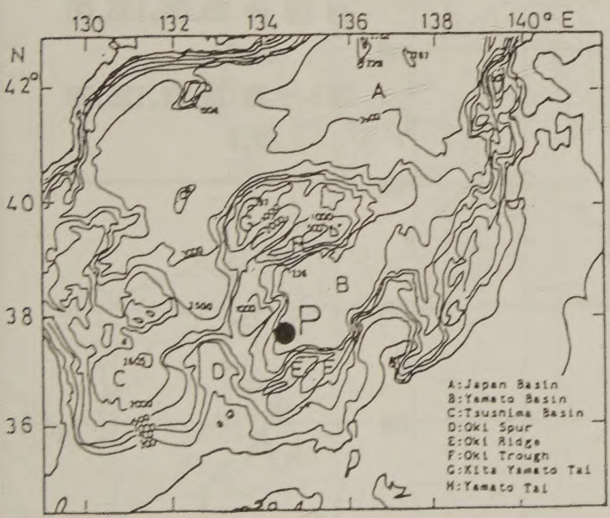


図 A. 日本海の海底地形図及び観測点 P の位置

Fig. A. Bottom topography in the Japan Sea, and the location of the Station P.

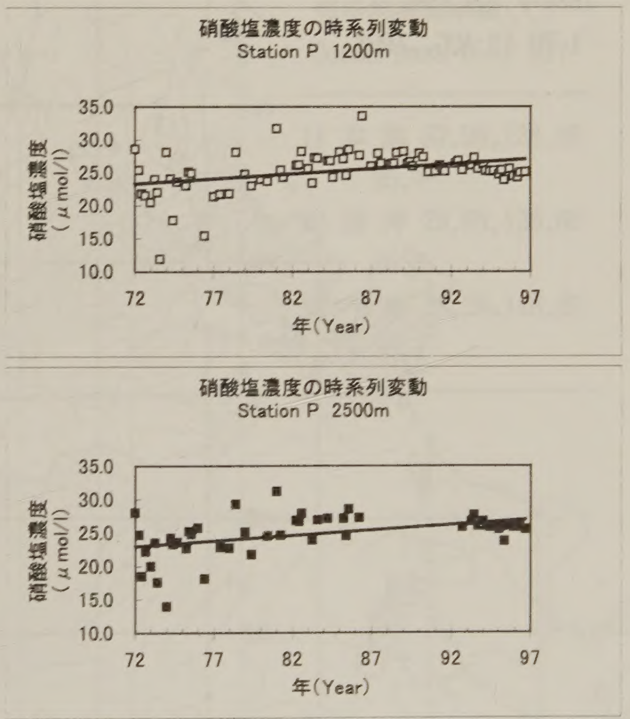
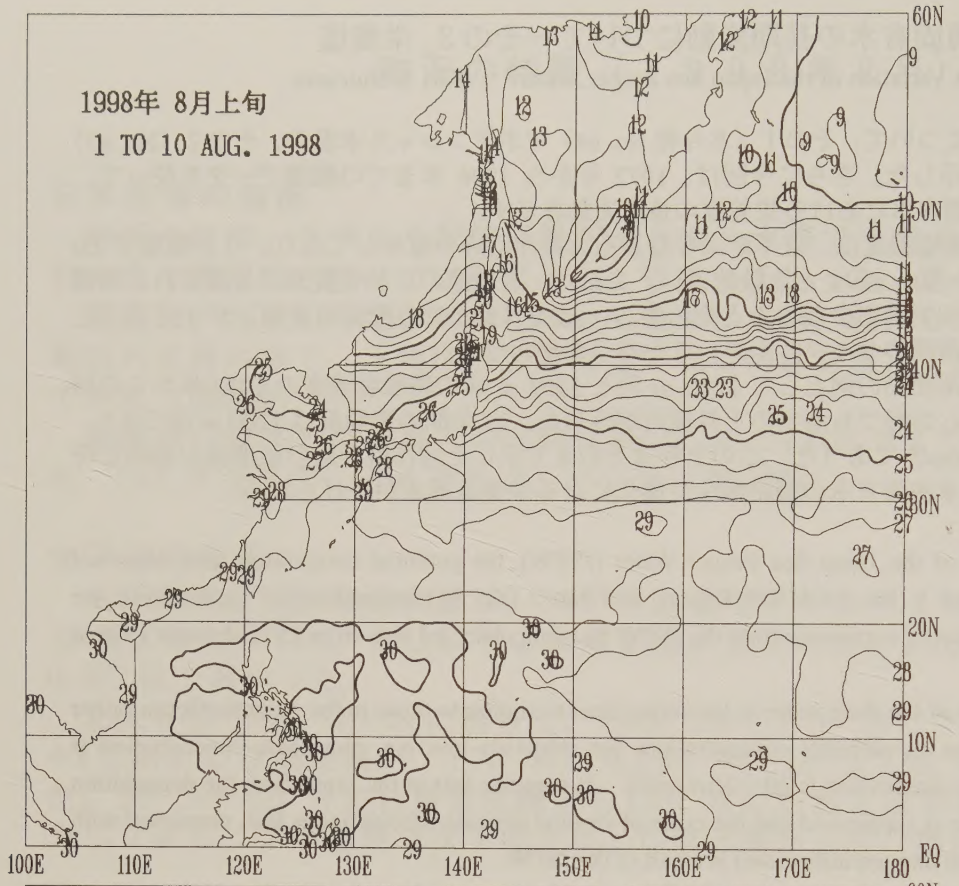
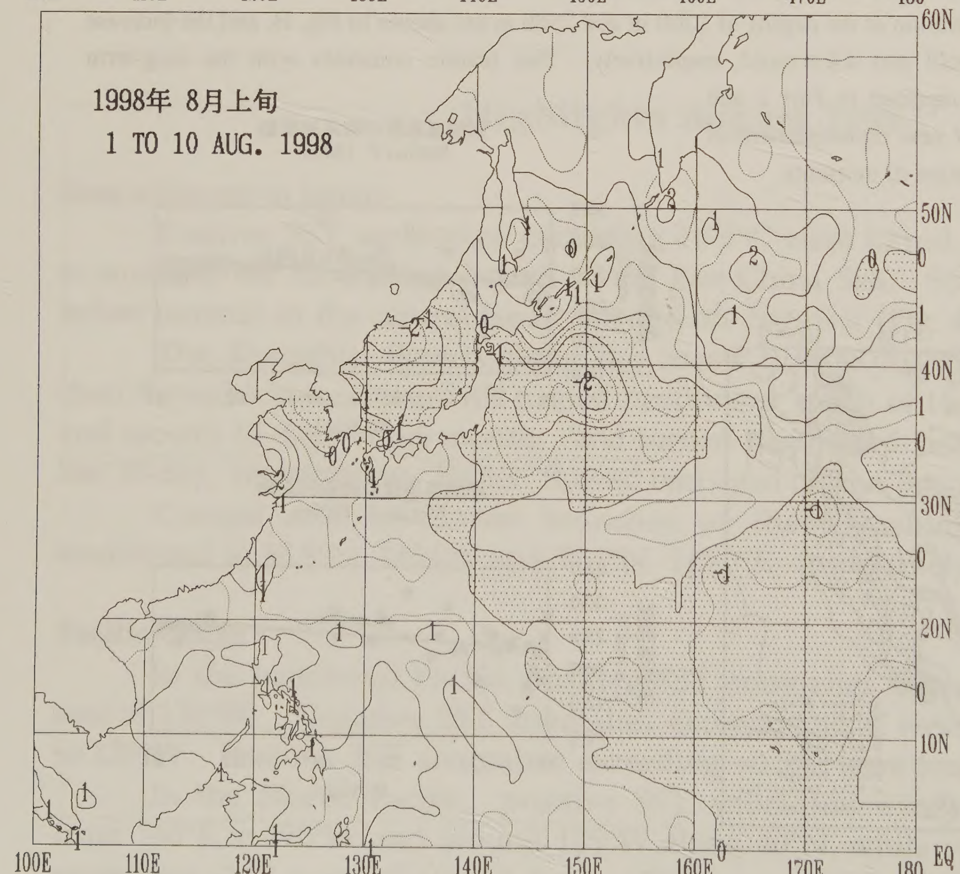


図 B. 1200 m 深(上), 2500 m 深(下)の硝酸塩の時系列図

Fig. B. Time series of nitrate concentration at 1200 m (upper) and 2500 m (lower).



旬平均沿岸水温(℃) Coastal Water Temperature		
地点名 (Index Number)	水温 Temp.	偏差 Anom.
石　垣(47918)	29.5	0.4
御前崎(47655)	25.5	-0.4
八丈島(47678)	25.8	-0.9
小名浜(47598)	20.1	-0.3
宮　古(47585)	17.7	-0.9
江　差(47428)	23.1	-
浜　田(47755)	27.1	-

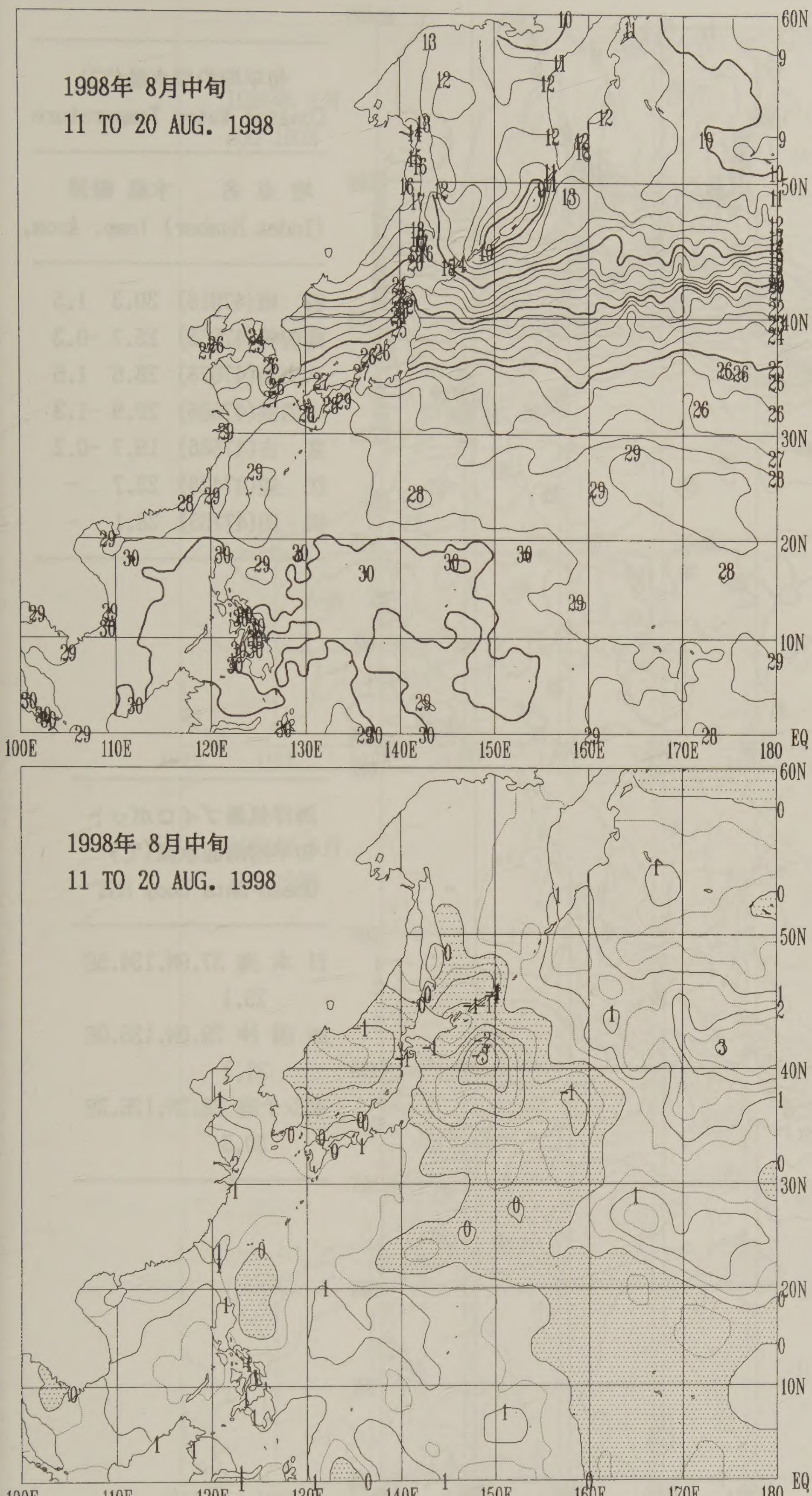


海洋気象ブイロボット 旬平均海面水温(℃) Ocean Data Buoy SST	
日本海 37.9N,134.5E	25.0
四国沖 29.0N,135.0E	29.7
東シナ海 28.2N,126.3E	29.8

第1図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(1998年 8月上旬)

Fig.1 Ten-day mean SST (top) and anomalies (bottom) in the western North Pacific for the 1st ten-day period in AUG 1998. Anomalies are computed from the JMA climatology (1961-90). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.

Ten-day mean SST & Anomalies

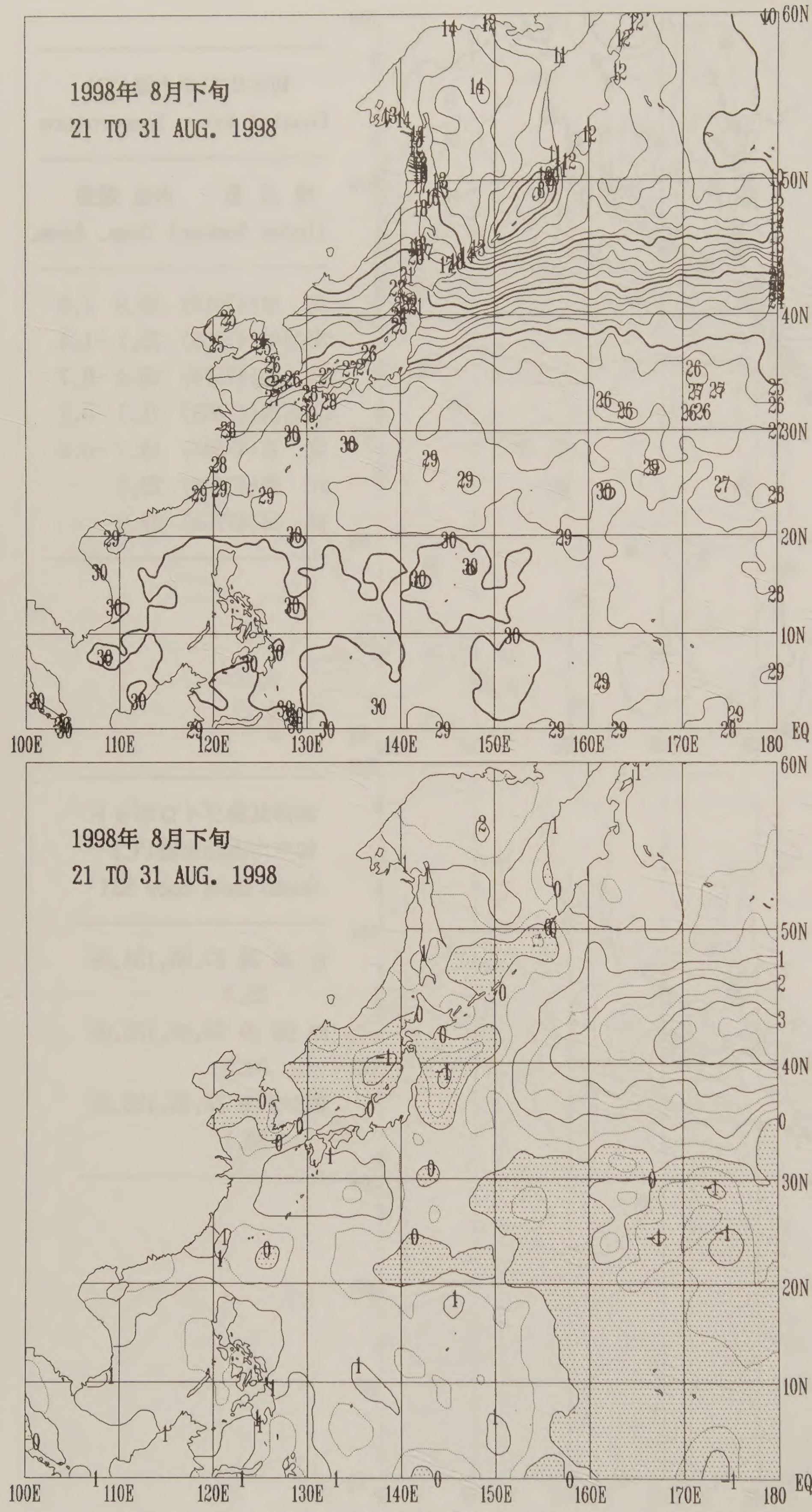


旬平均沿岸水温(℃) Coastal Water Temperature		
地 点 名 (Index Number)	水温 Temp.	偏差 Anom.
石　垣(47918)	29.9	1.0
御前崎(47655)	25.1	-1.4
八丈島(47678)	26.4	-0.7
小名浜(47598)	21.1	-0.3
宮　古(47585)	18.7	-0.8
江　差(47428)	23.0	-
浜　田(47755)	27.9	-

海洋気象ブイロボット 旬平均海面水温(℃) Ocean Data Buoy SST	
日 本 海 37.9N,134.5E	25.7
四 国 沖 29.0N,135.0E	30.5
東シナ海 28.2N,126.3E	30.1

第2図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(1998年 8月中旬)

Fig.2 Ten-day mean SST (top) and anomalies (bottom) in the western North Pacific for the 2nd ten-day period in AUG 1998. Anomalies are computed from the JMA climatology (1961-90). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.



旬平均沿岸水温(℃)
Coastal Water Temperature

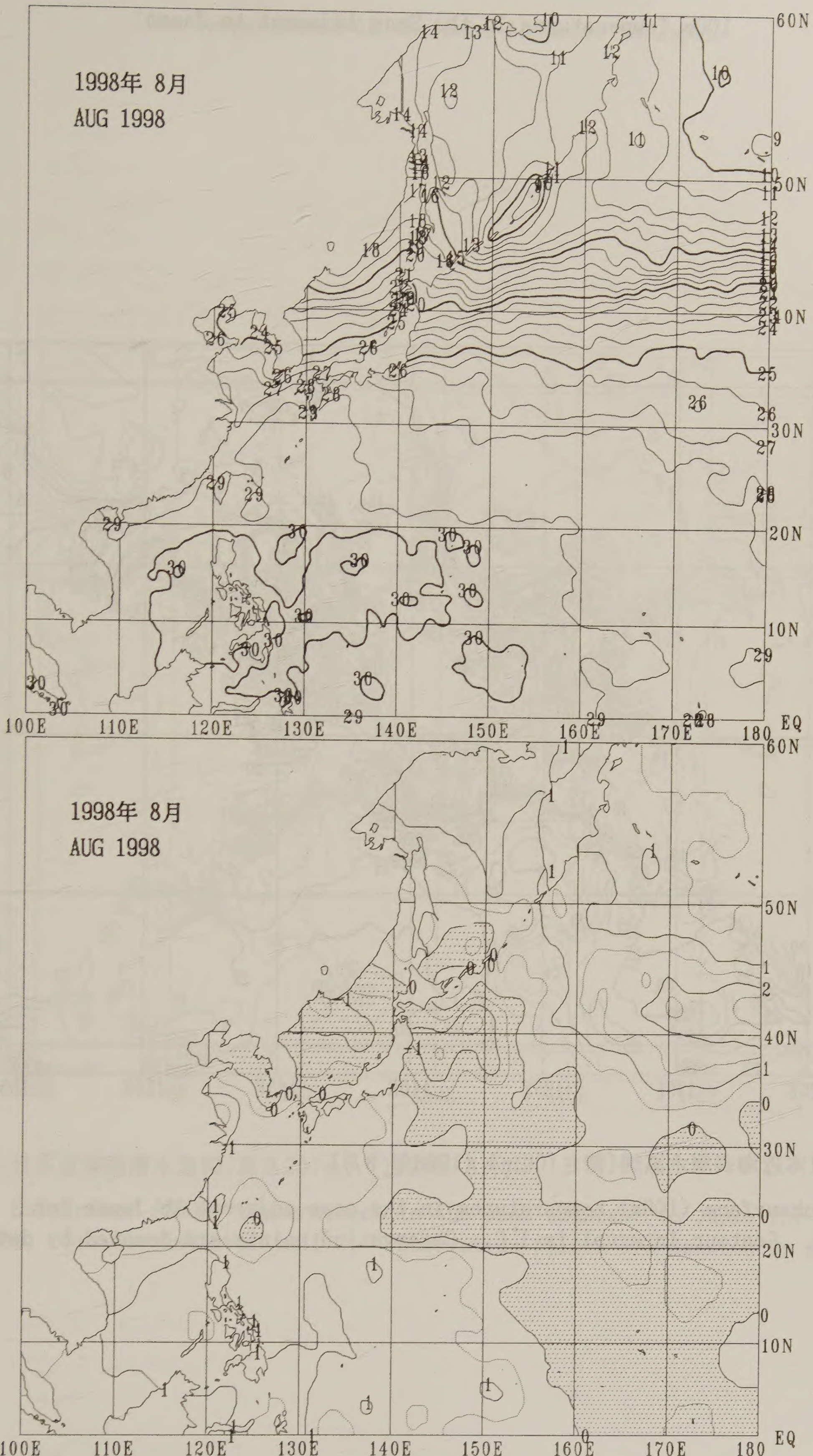
地点名 (Index Number)	水温 Temp.	偏差 Anom.
石　垣(47918)	30.3	1.5
御前崎(47655)	25.7	-0.3
八丈島(47678)	28.6	1.6
小名浜(47598)	20.9	-1.3
宮　古(47585)	19.7	-0.2
江　差(47428)	23.7	-
浜　田(47755)	28.1	-

海洋気象ブイロボット
旬平均海面水温(℃)
Ocean Data Buoy SST

日本海	37.9N,134.5E	25.1
四国沖	29.0N,135.0E	31.1
東シナ海	28.2N,126.3E	30.3

第3図 北西太平洋旬平均海面水温図(上)及び偏差図(下)(1998年 8月下旬)

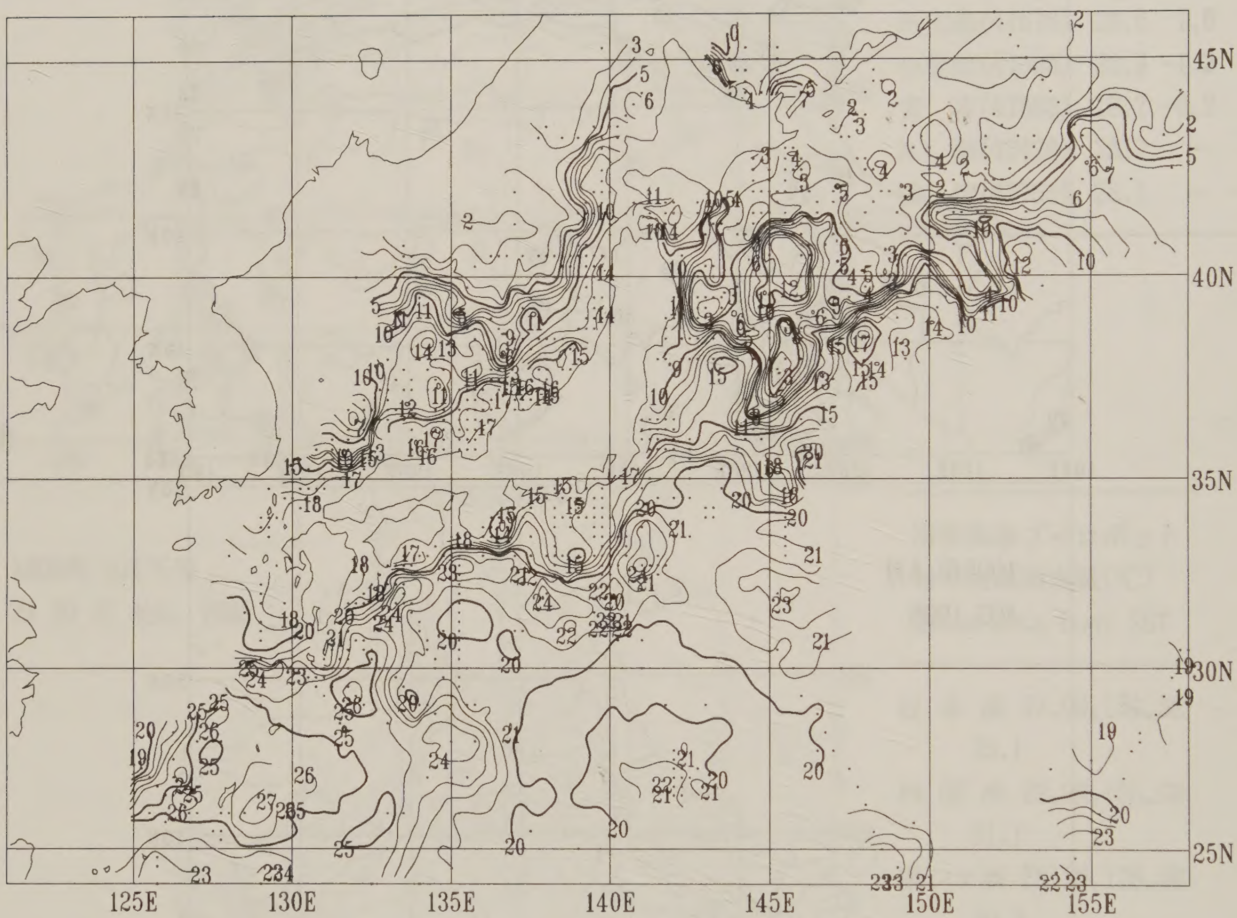
Fig.3 Ten-day mean SST (top) and anomalies (bottom) in the western North Pacific for the 3rd ten-day period in AUG 1998. Anomalies are computed from the JMA climatology (1961-90). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.



第4図 北西太平洋月平均海面水温図(上)及び偏差図(下)(1998年 8月)

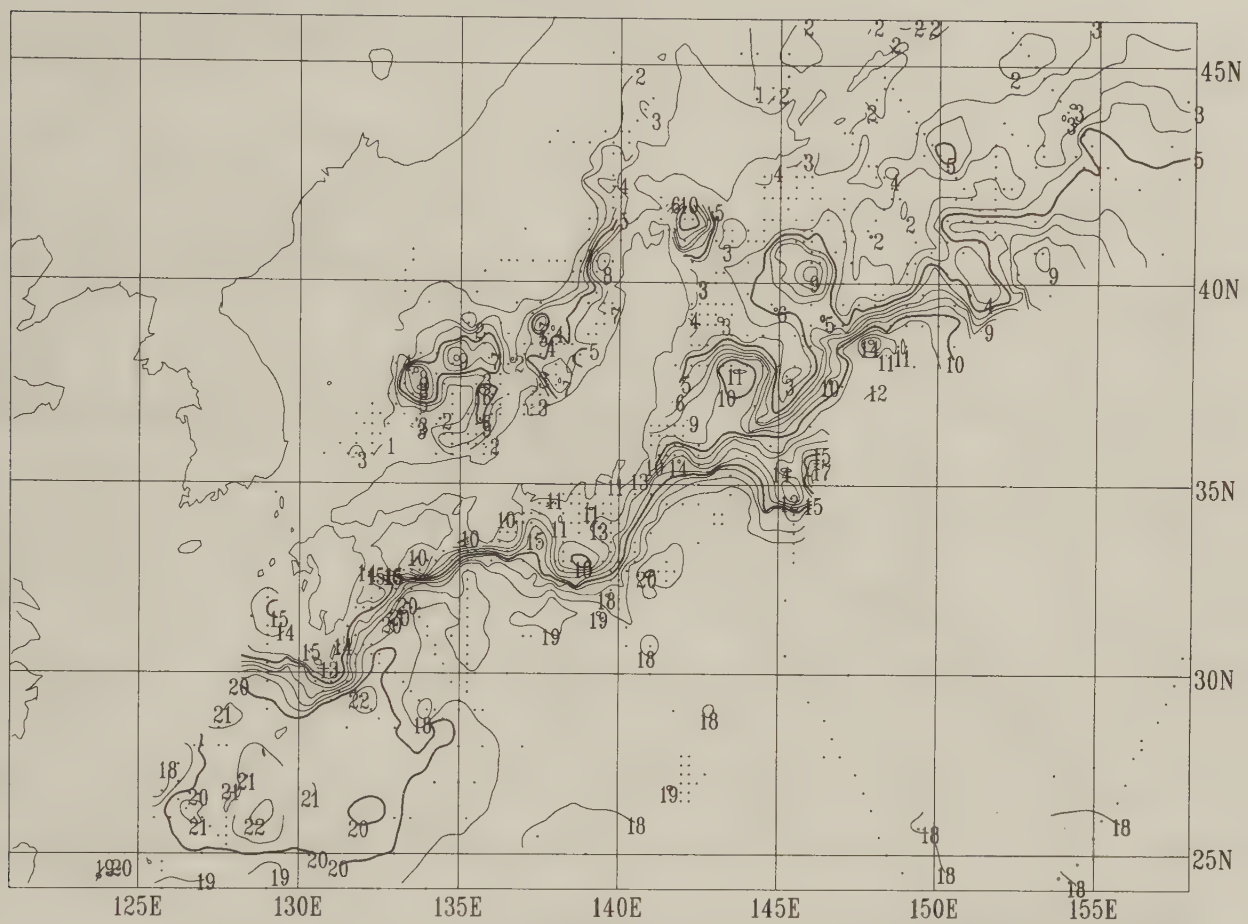
Fig.4 Monthly mean SST (top) and anomalies (bottom) in the western North Pacific for AUG 1998. Anomalies are computed from the JMA climatology (1961-1990). Contour interval is 1°C and additional anomaly contours of 0.5°C are shown by broken lines. Negative anomalies are spotted.

100m Temperatures in the Seas Adjacent to Japan



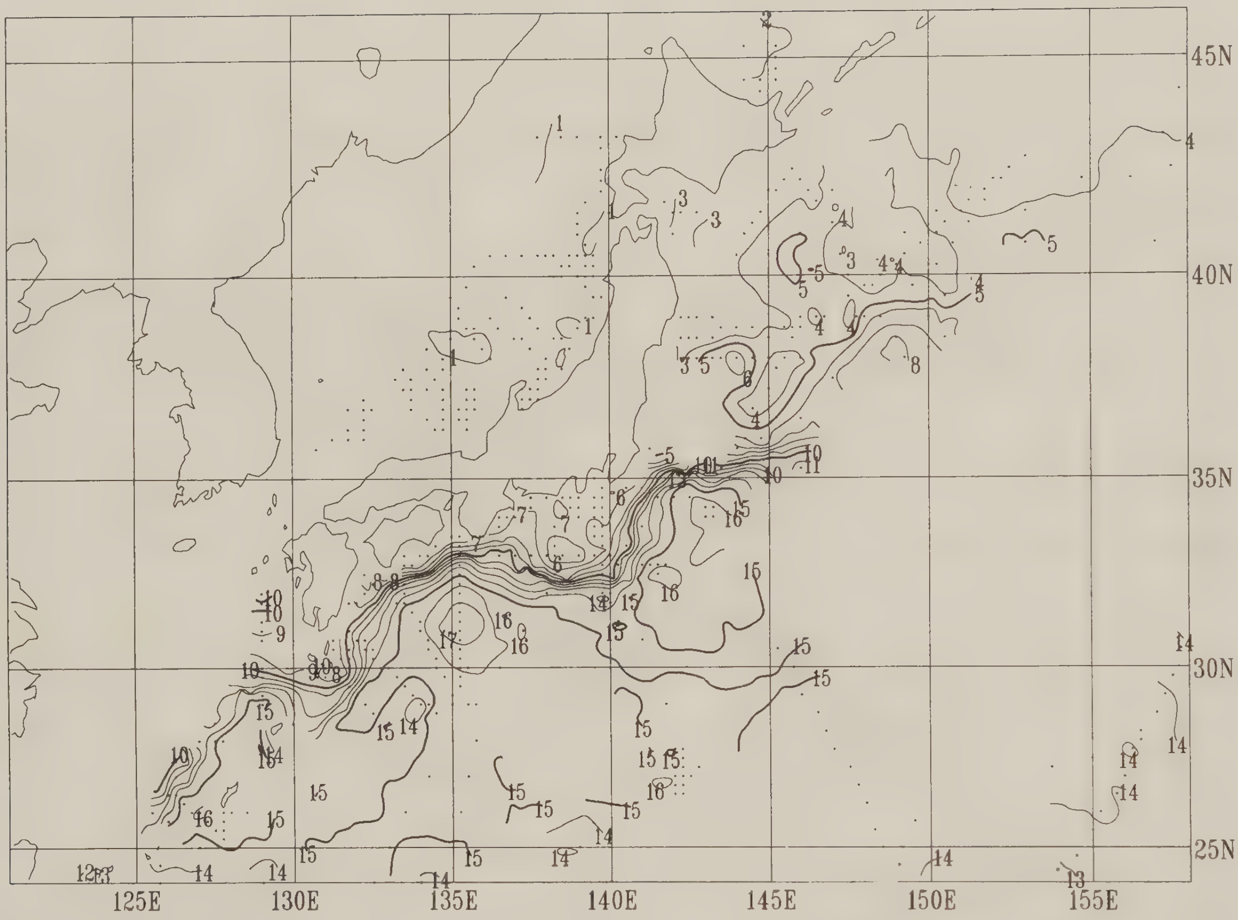
第5図　日本近海表層水温図(深さ100m) (1998年 8月)

Fig.5 Subsurface (100m) temperatures in the seas adjacent to Japan for AUG 1998. Contour interval is 1°C. Observation points are denoted by dots.



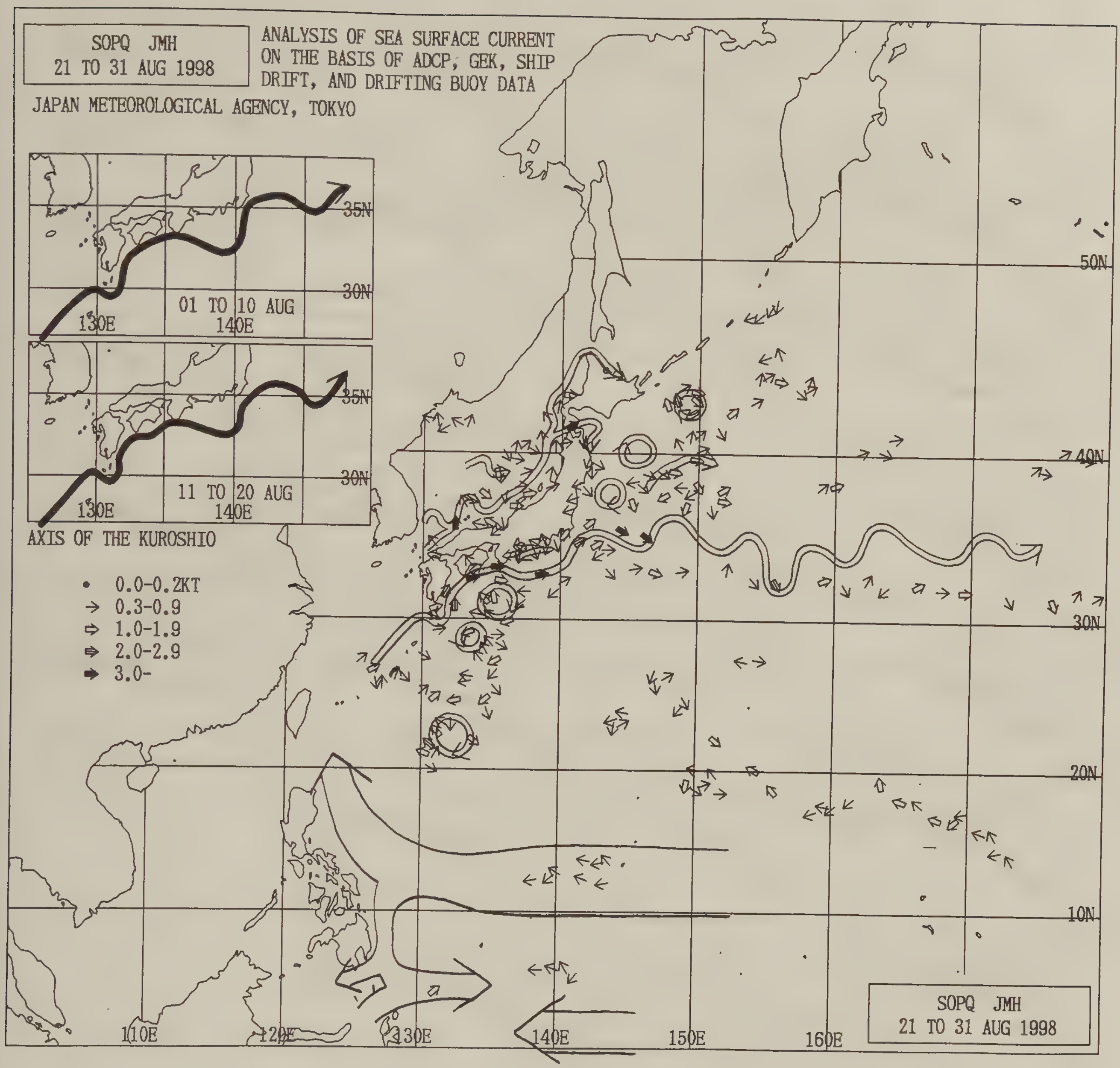
第6図　日本近海表層水温図(深さ200m) (1998年 8月)

Fig.6 Subsurface (200m) temperatures in the seas adjacent to Japan for AUG 1998. Contour interval is 1°C. Observation points are denoted by dots.



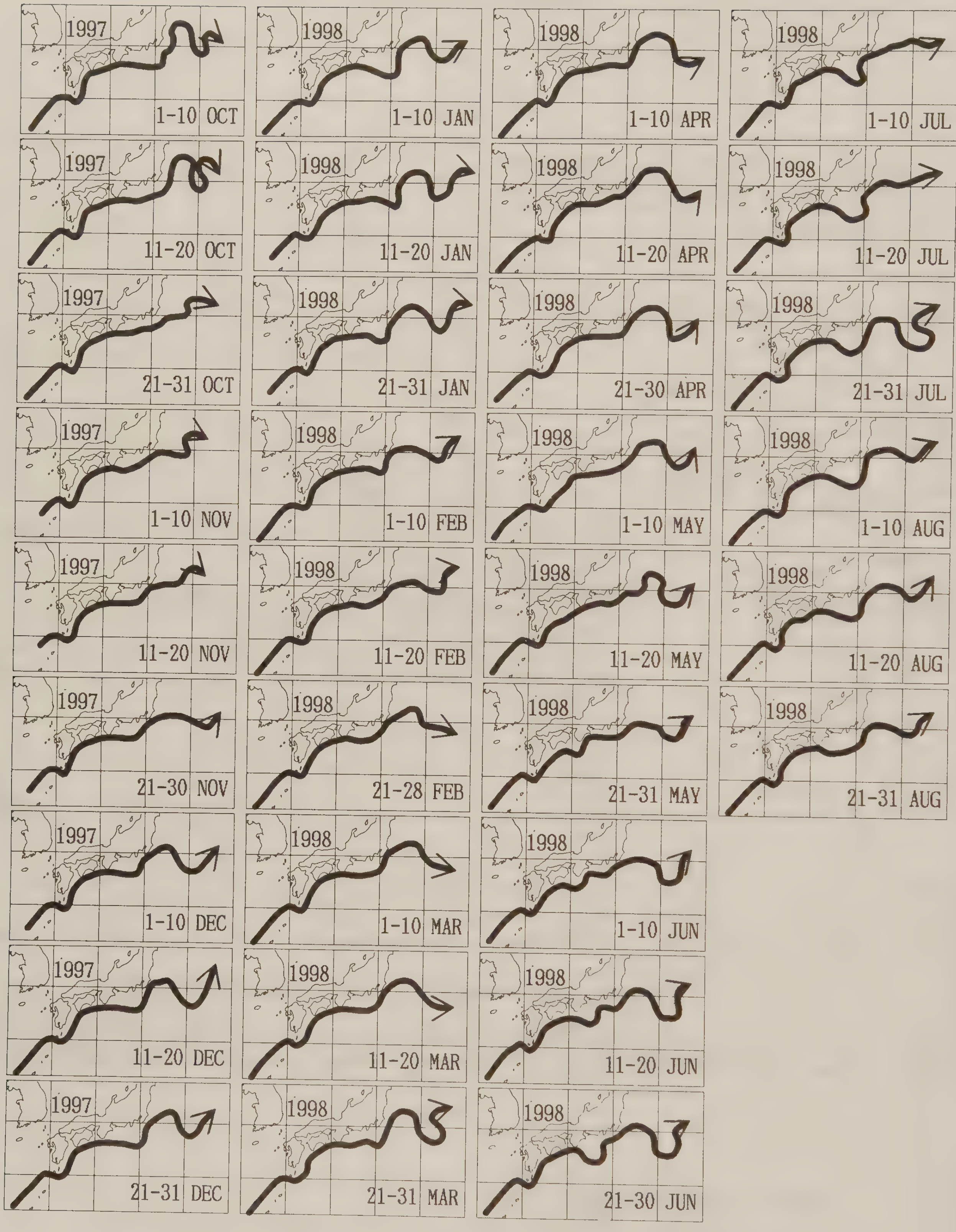
第7図　日本近海表層水温図(深さ400m) (1998年 8月)

Fig.7 Subsurface (400m) temperatures in the seas adjacent to Japan for AUG 1998. Contour interval is 1°C. Observation points are denoted by dots.



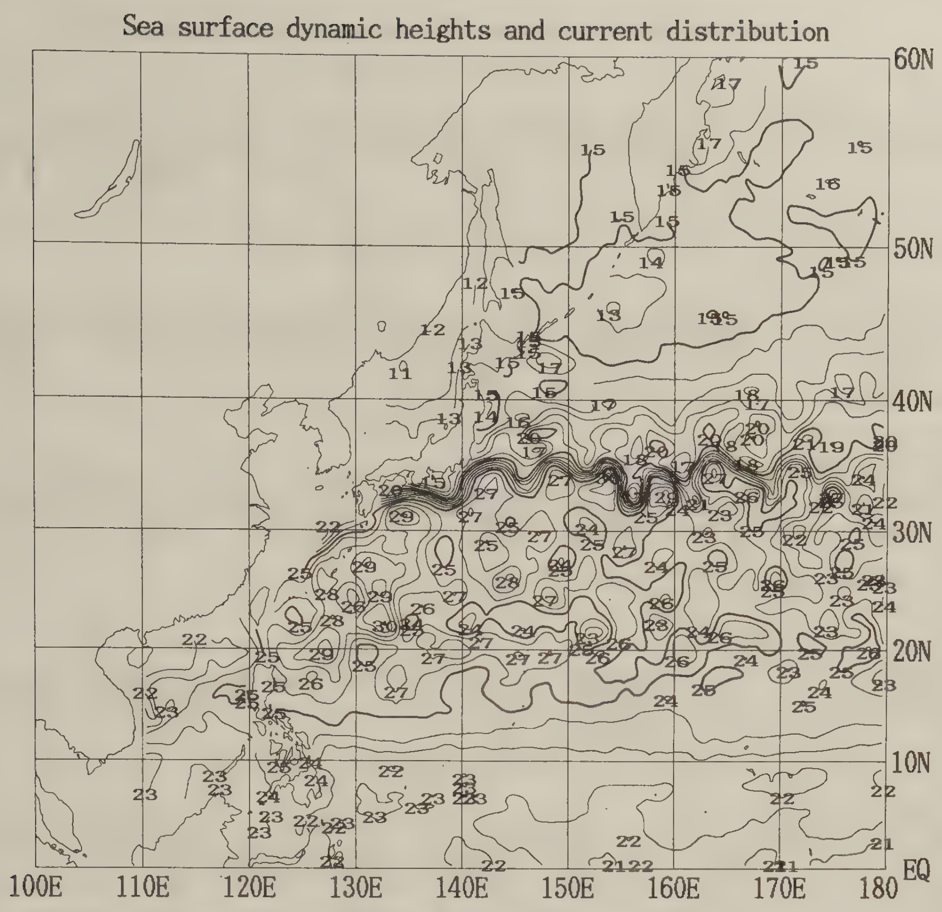
第8図　北西太平洋海流図（1998年 8月下旬）

Fig.8 Analysis of the sea surface current in the western North Pacific for the 3rd ten-day period in AUG 1998. Small arrows indicate in situ observations. Major currents such as the Kuroshio and the North Equatorial Current are denoted by larger open arrows.



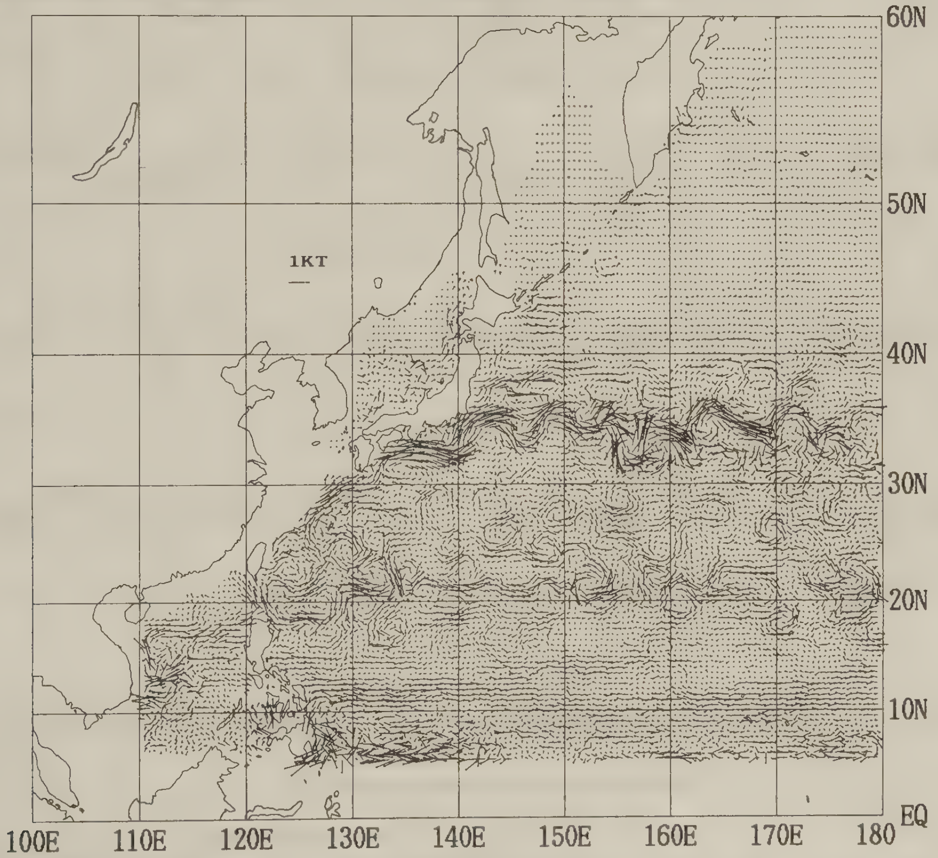
第9図 旬別黒潮流軸図

Fig.9 Location of the Kuroshio axis



第10図 北西太平洋力学的海面高度分布図(1998年 8月19日)

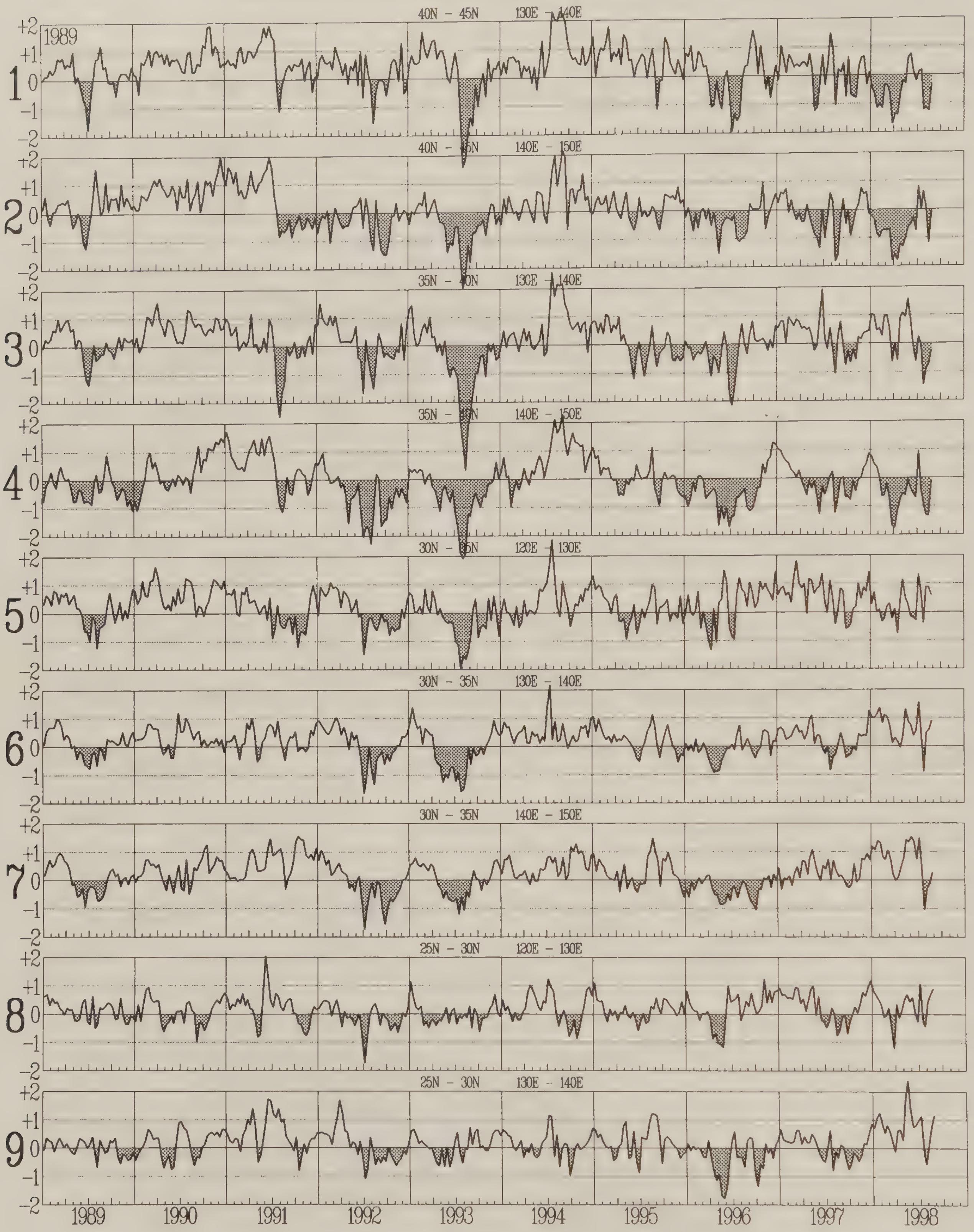
Fig.10 Sea surface dynamic heights (10cm) in the western North Pacific derived from the altimeter data of TOPEX/POSEIDON (AUG 19, 1998).
1500db surface is assumed to be the surface of no motion.

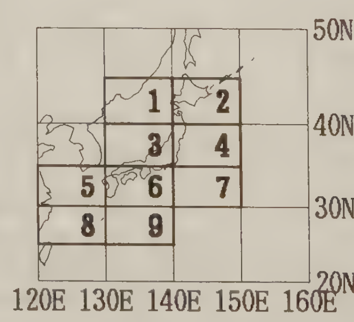


第11図 北西太平洋海流ベクトル図(1998年 8月19日)

Fig.11 Sea surface current vectors in the western North Pacific (AUG 19, 1998).
Vectors are derived from the sea surface dynamic heights from TOPEX/POSEIDON and subsurface temperature distribution assuming the geostrophic relation.

Time Series of Area Mean SST in the Western North Pacific

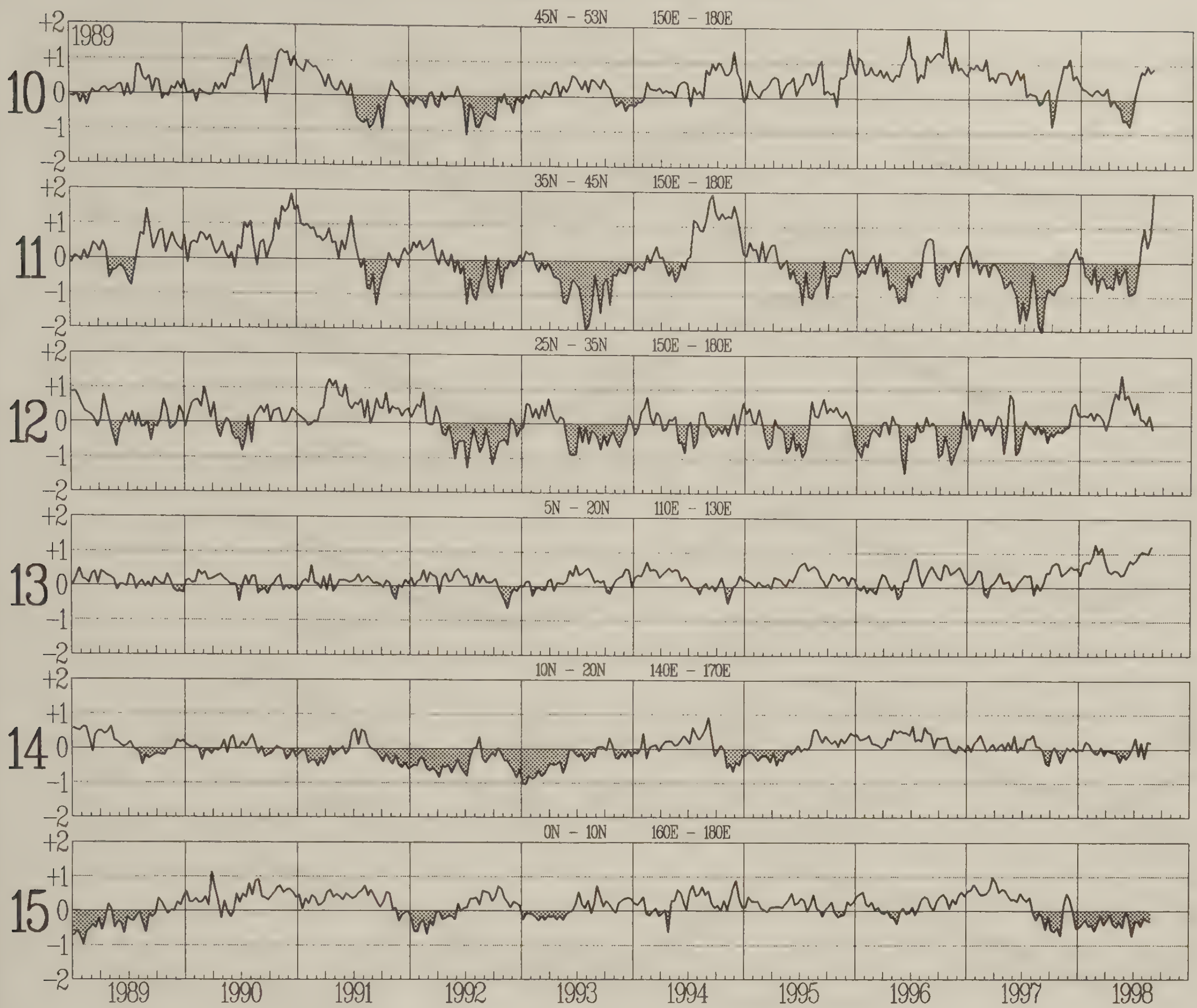




第12図　海域別旬平均海面水温平年偏差時系列図

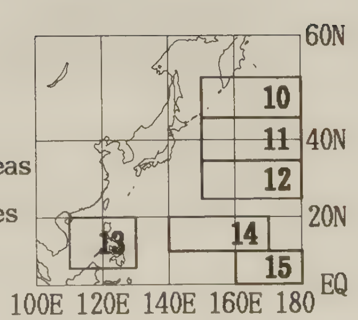
Fig.12 Time series of the ten-day mean sea surface temperature anomalies (°C) in the western North Pacific for the areas shown in the right panel. Negative anomalies are shaded. Anomalies are computed from the JMA climatology (1961-90).

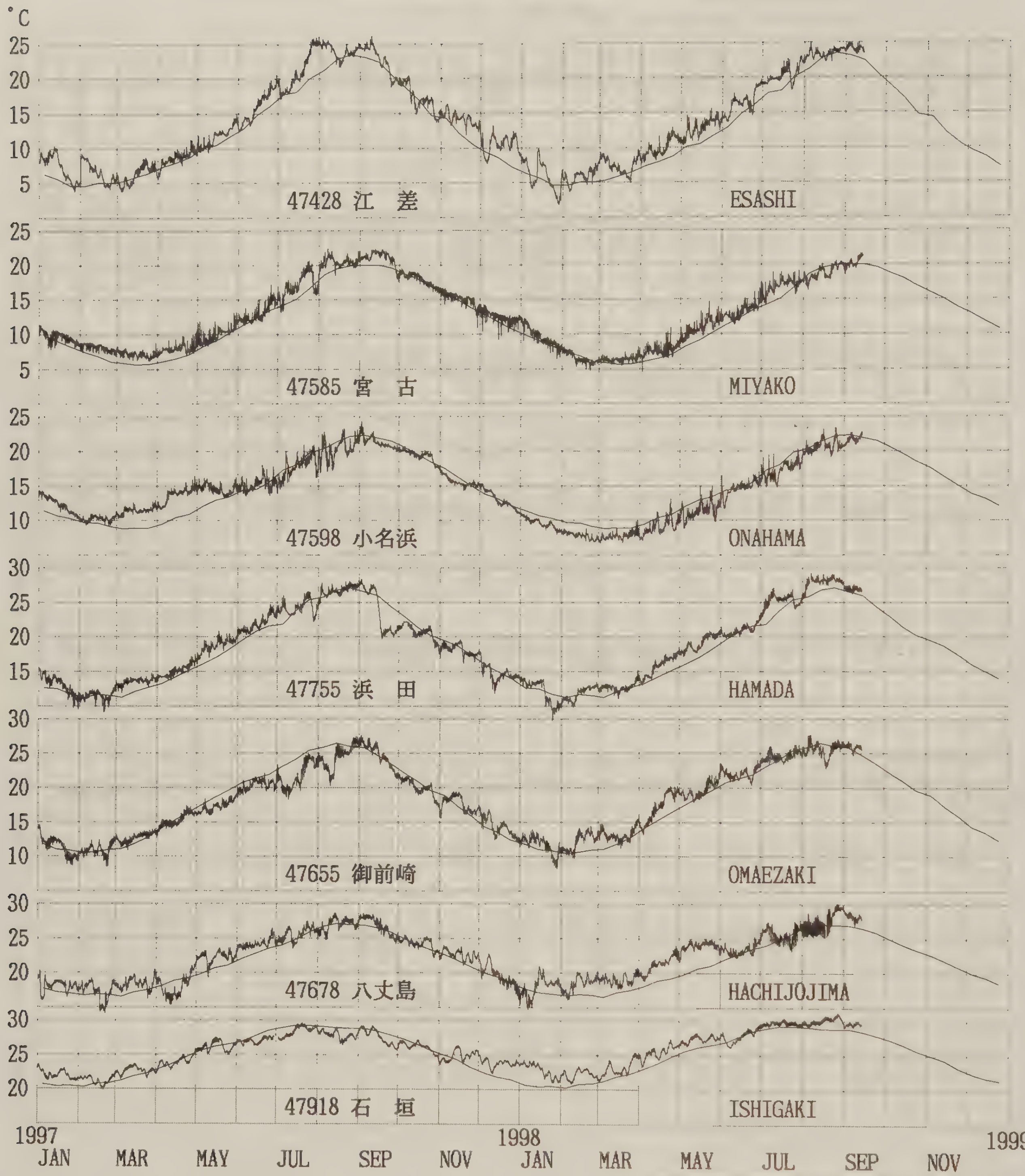
Time Series of Area Mean SST in the Western North Pacific

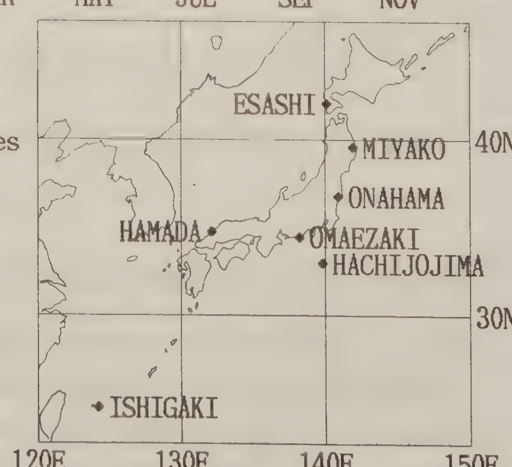


第12図　海域別旬平均海面水温平年偏差時系列図（つづき）

Fig.12 (continue) Time series of the ten-day mean sea surface temperature anomalies (˚C) in the western North Pacific for the areas shown in the right panel. Negative anomalies are shaded. Anomalies are computed from the JMA climatology (1961-90).

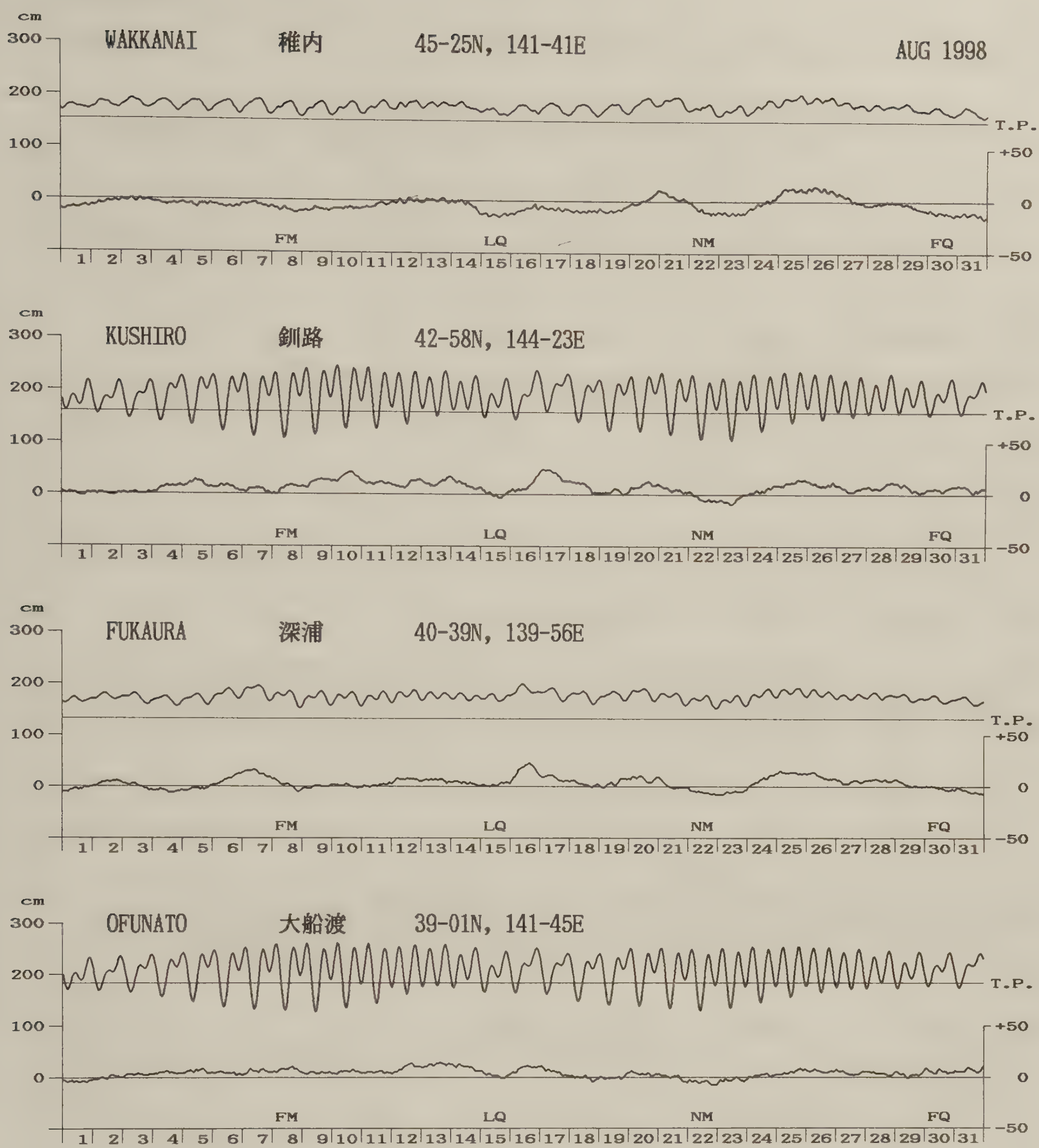






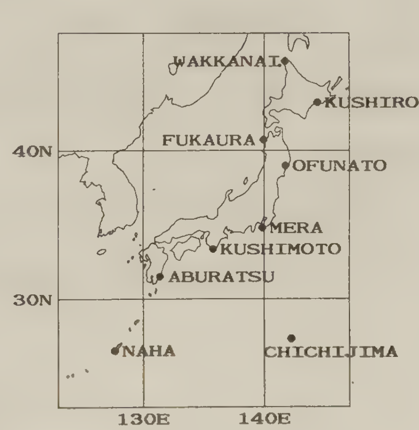
第13図 沿岸水温時系列図

Fig.13 Time series of hourly coastal water temperatures (°C) measured at 7 coastal stations of the JMA shown in the right panel.
Thin lines show ten-day mean climatology.

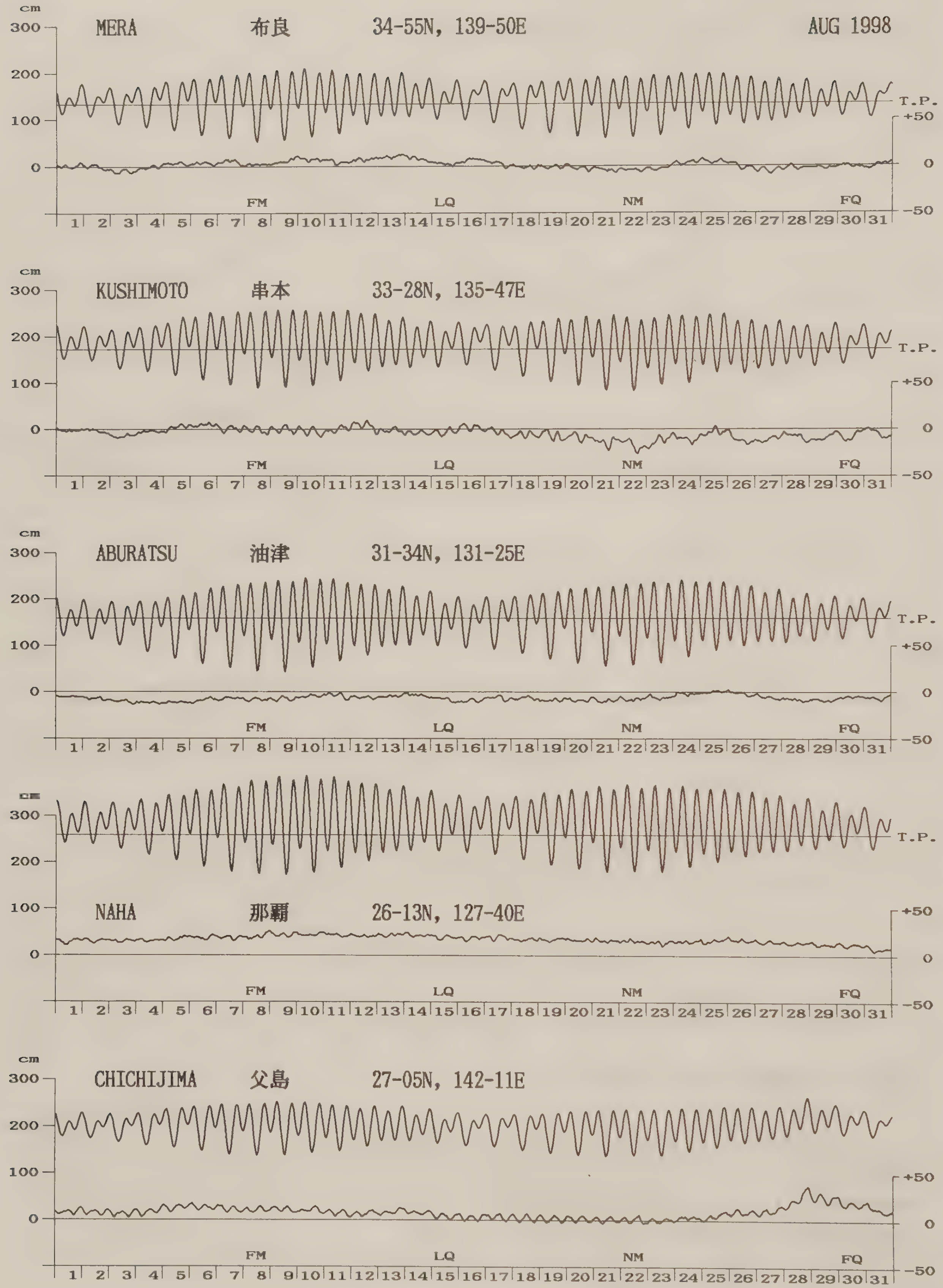


第14図 沿岸潮位時系列図（1998年 8月）

Fig.14 Time series of hourly sea level observation (upper line) and its anomalies (lower line) at 9 stations of the JMA in the right panel.
Short term variations are removed from raw data.

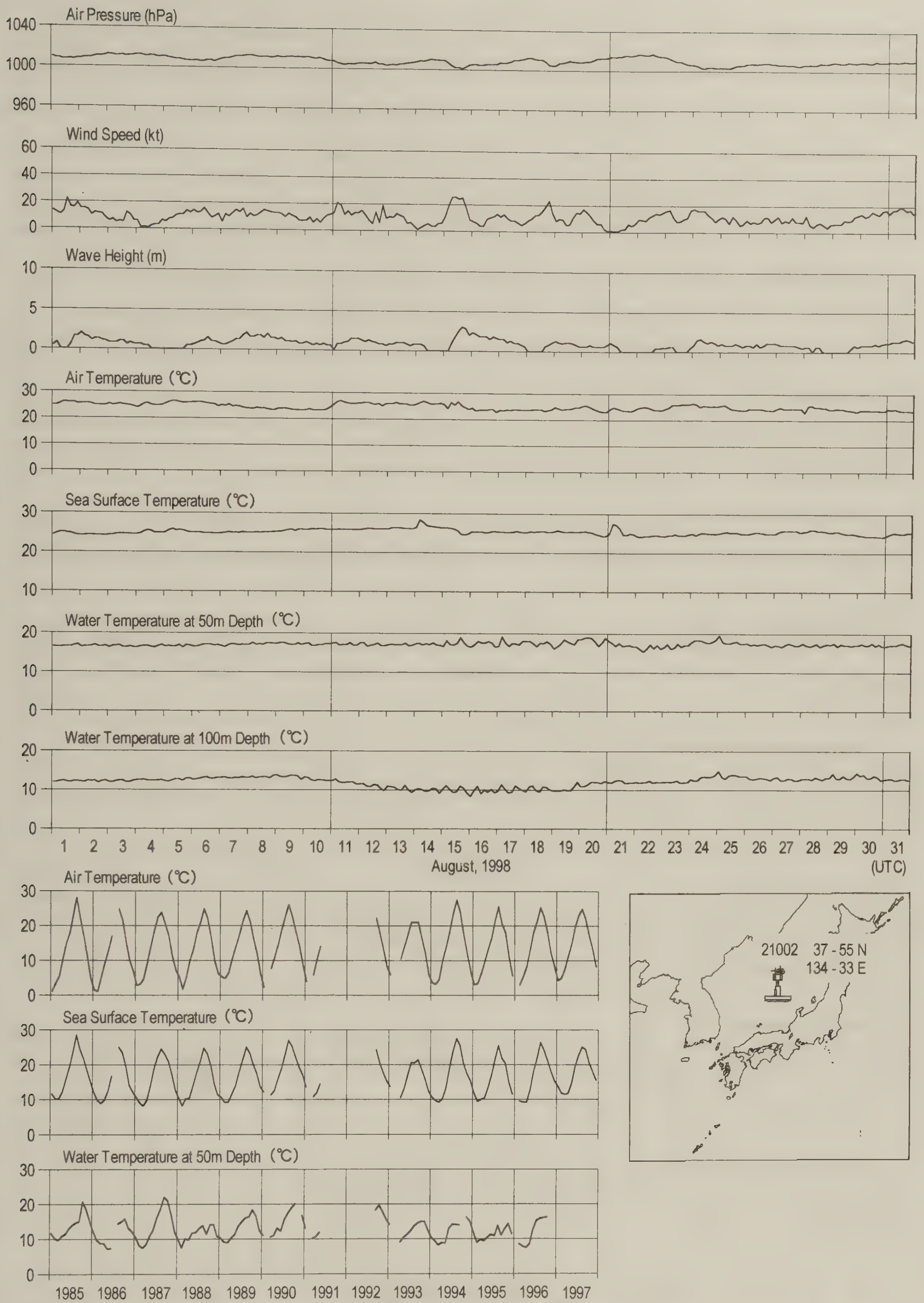


FM: full moon, FQ: first quarter
NM: new moon, LQ: last quarter
T.P.: Mean sea level of Tokyo Bay (Tokyo Peil)



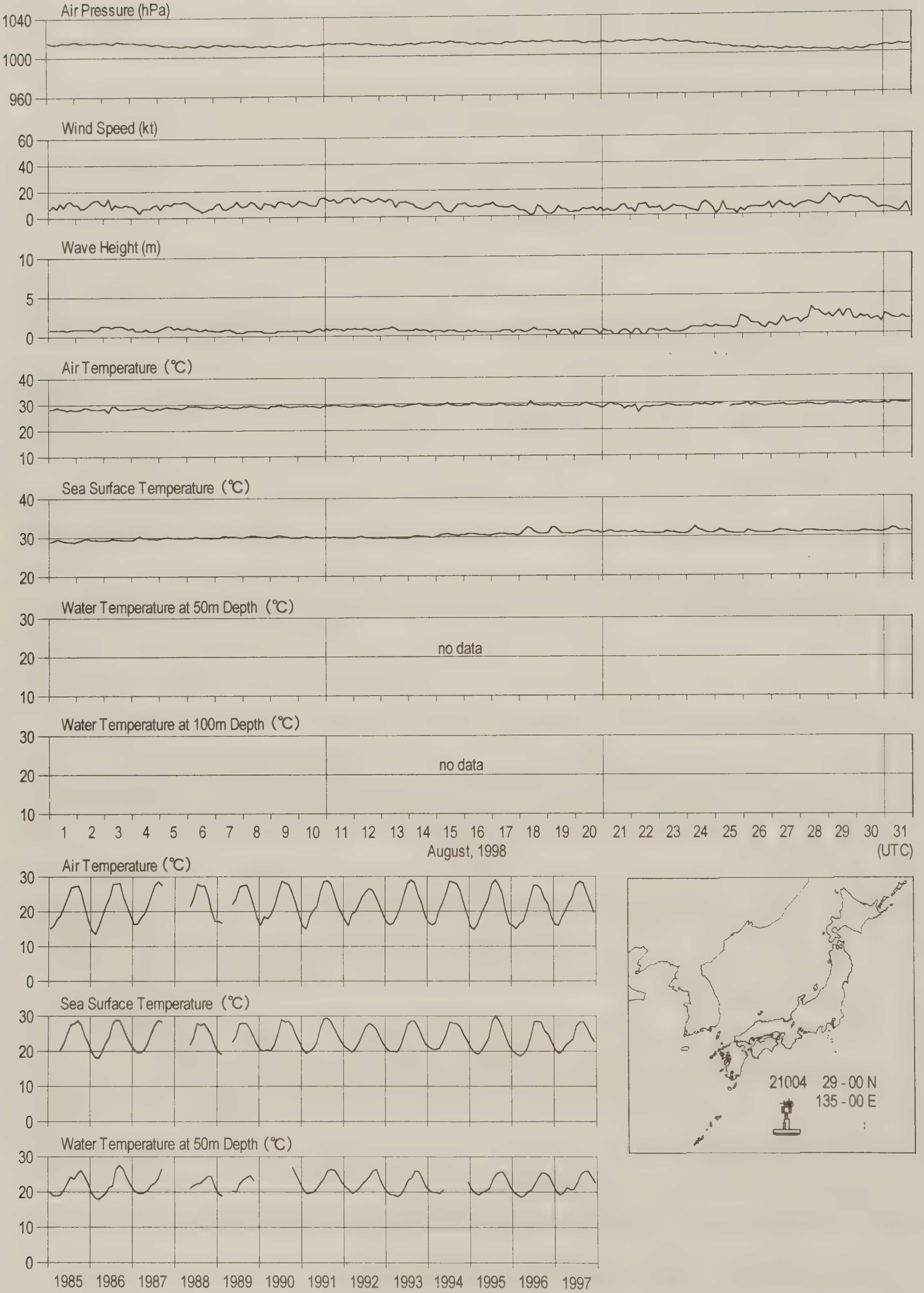
第14図 つづき

Fig.14 continue



第15図　海洋気象ブイロボットによる観測要素の時系列図（日本海：21002）
上段は３時間毎の観測値を、下段は月平均値を示す。

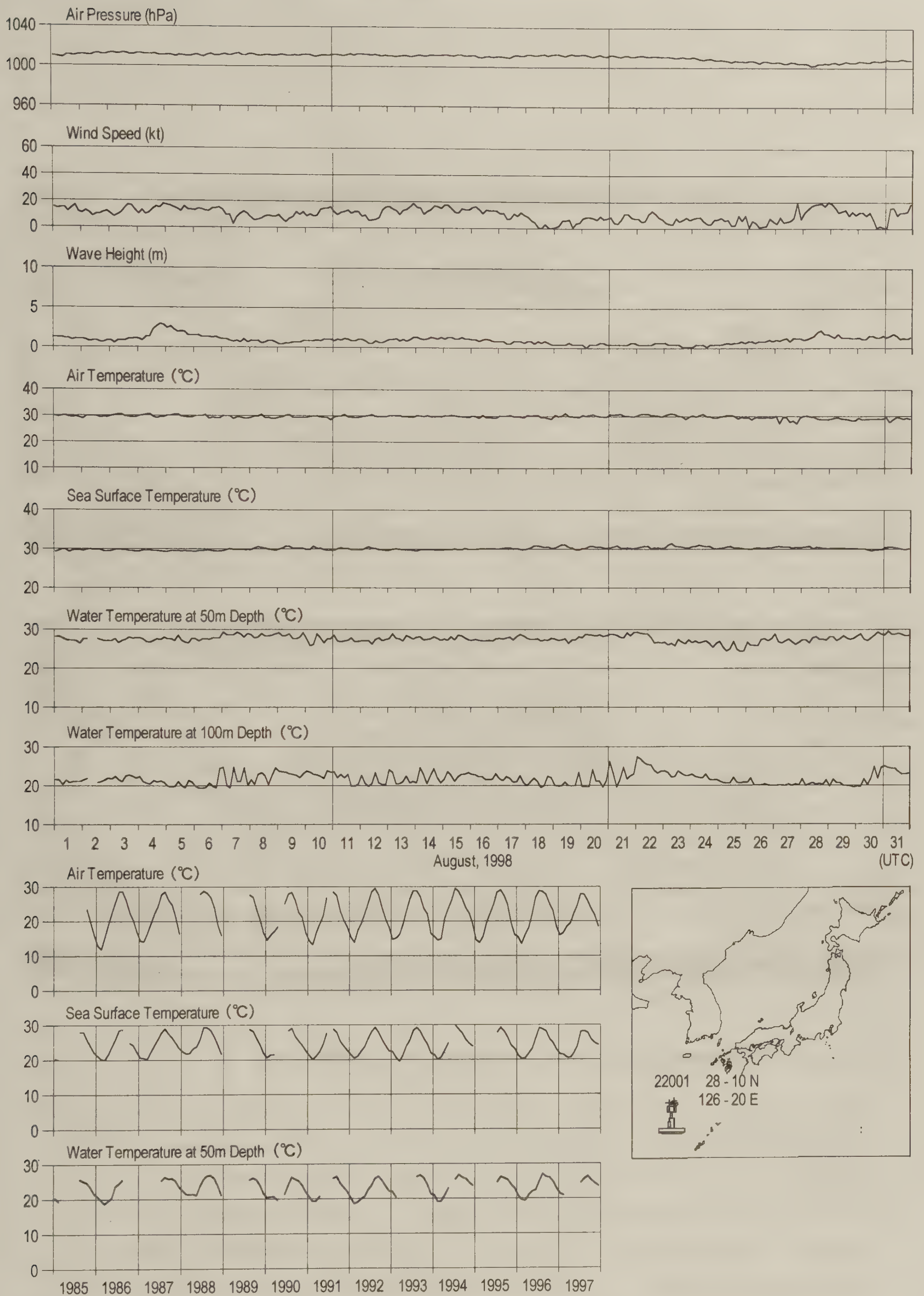
Fig. 15　Time series of JMA buoy observation in the Japan Sea (WMO ID No. 21002). The upper panel shows three hourly observation and the lower panel shows the monthly mean data.



第15図　海洋気象ブイロボットによる観測要素の時系列図（四国沖：21004）
上段は３時間毎の観測値を、下段は月平均値を示す。

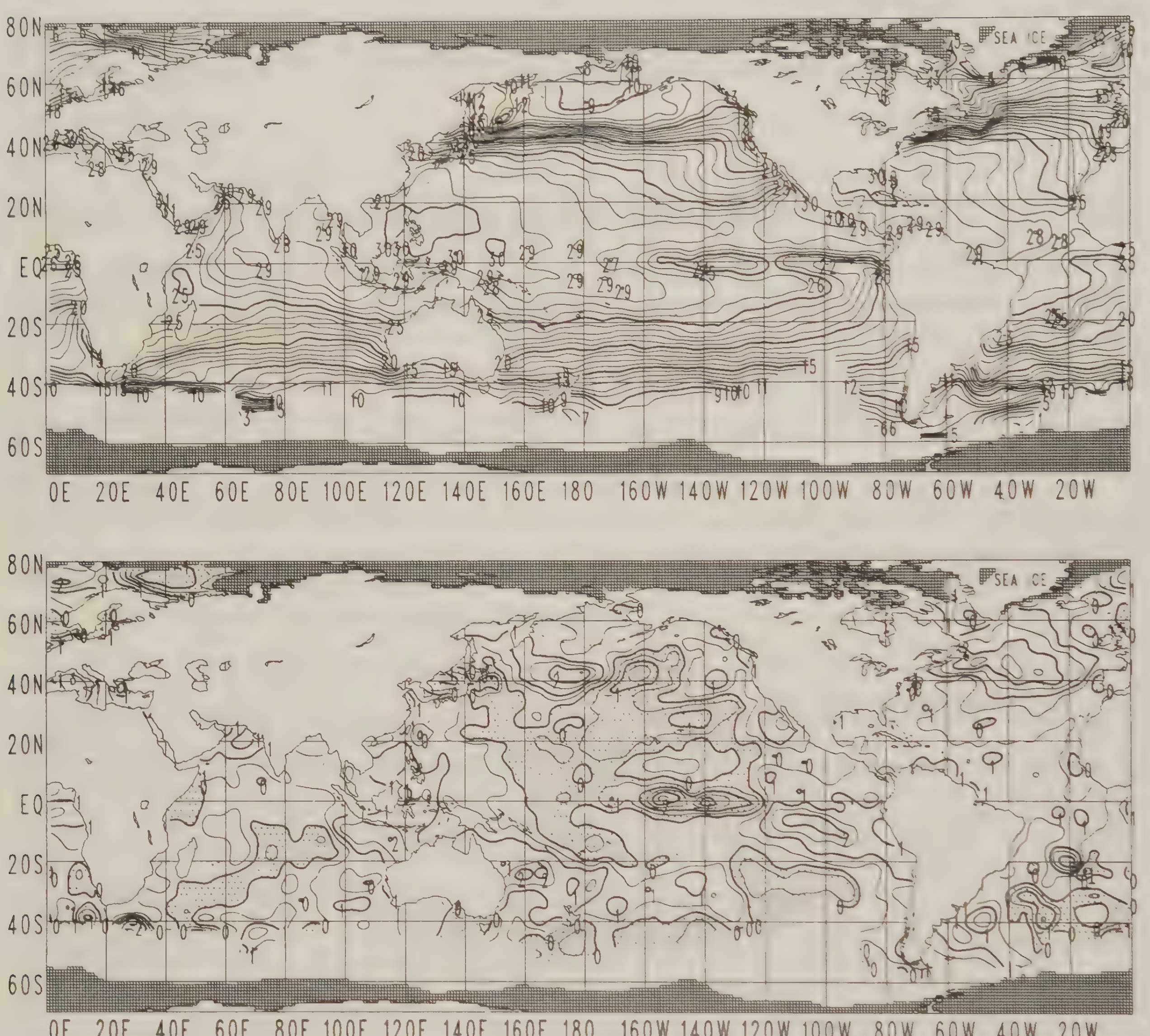
Fig. 15　Time series of JMA buoy observation south of Shikoku (WMO ID No. 21004).
The upper panel shows three hourly observation and the lower panel shows the monthly mean data.

Ocean Data Buoy Observations



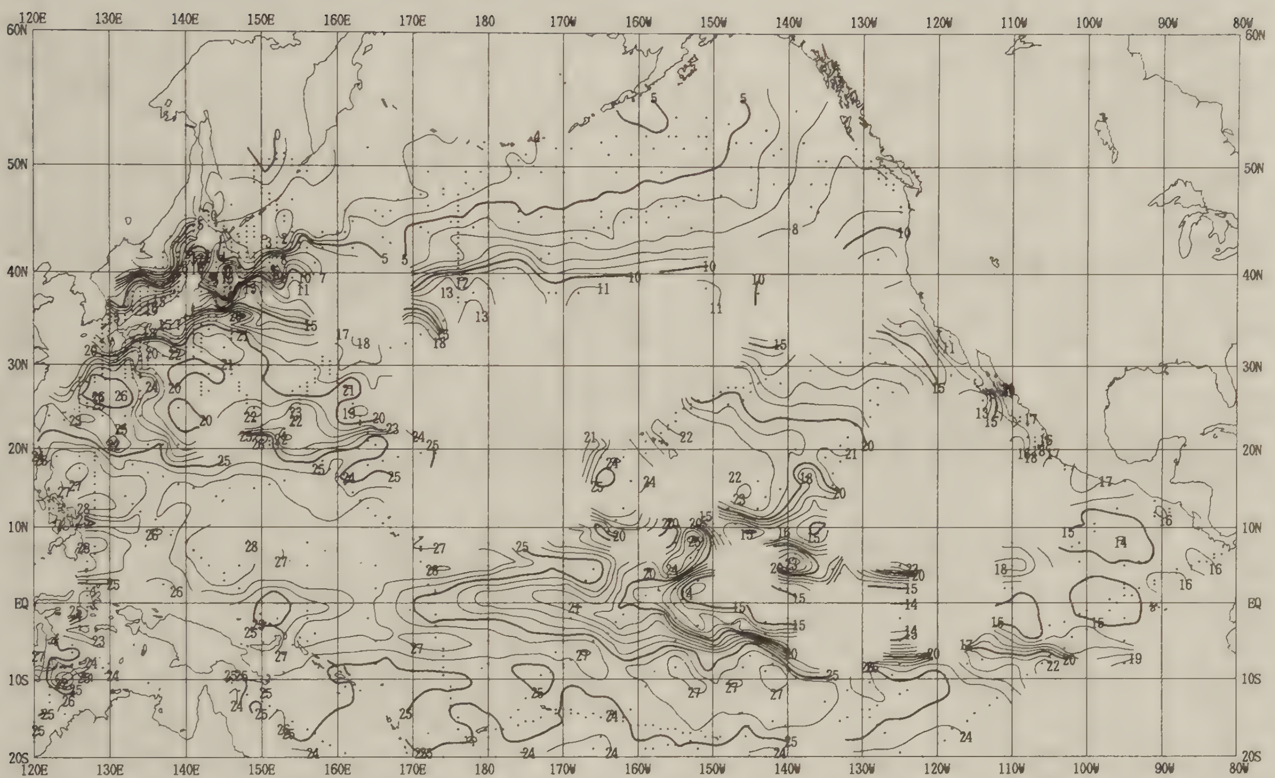
第15図　海洋気象ブイロボットによる観測要素の時系列図（東シナ海：22001）
上段は３時間毎の観測値を、下段は月平均値を示す。

Fig. 15　Time series of JMA buoy observation in the East China Sea (WMO ID No. 22001). The upper panel shows three hourly observation and the lower panel shows the monthly mean data.



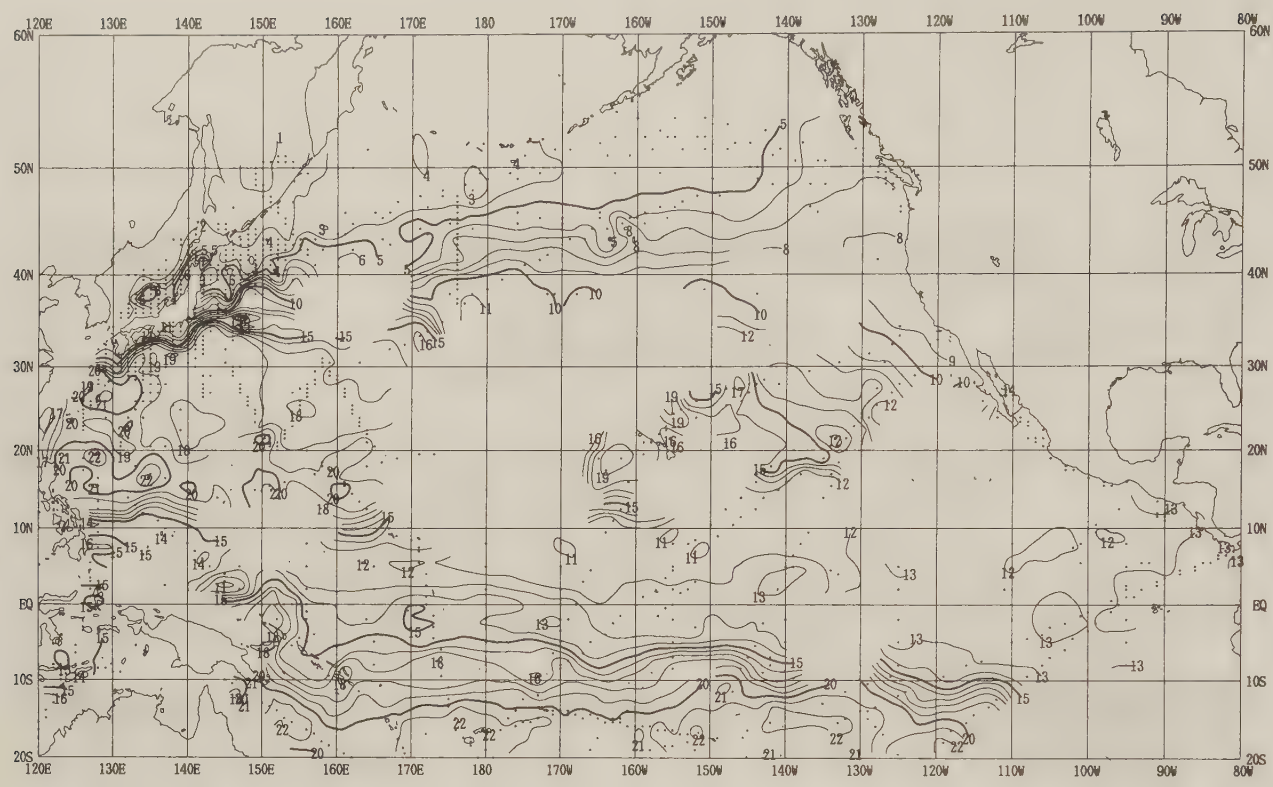
第16図　全球月平均海面水温図（上）及び偏差図（下）（1998年 8月）

Fig.16 Monthly mean sea surface temperature over the global ocean (top) and anomalies (bottom) for AUG 1998. Anomalies are computed from the JMA climatology (1961-1990). Contour interval is 1°C (top) and additional anomaly contours of ±0.5°C are shown by thin lines. Negative anomalies are spotted. Maximum coverage of sea ice is shaded. Data sources for sea ice are U.S. National Ice Center (polar regions) and JMA (the Sea of Okhotsk).



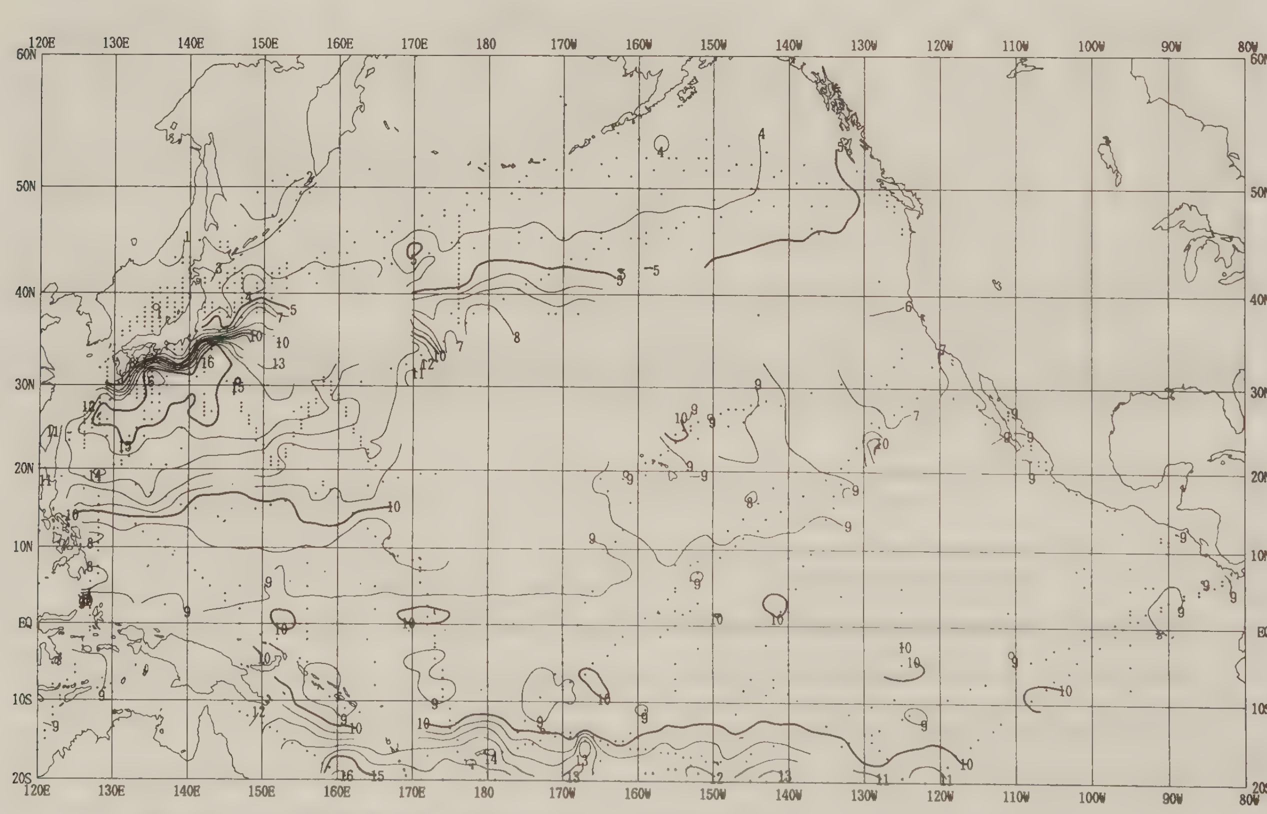
第17図　太平洋表層水温図(深さ100m) (1998年 8月)

Fig.17 Subsurface (100m) temperatures in the Pacific Ocean for AUG 1998. Contour interval is 1°C. Observation points are denoted by dots.



第18図　太平洋表層水温図(深さ200m)（1998年 8月）

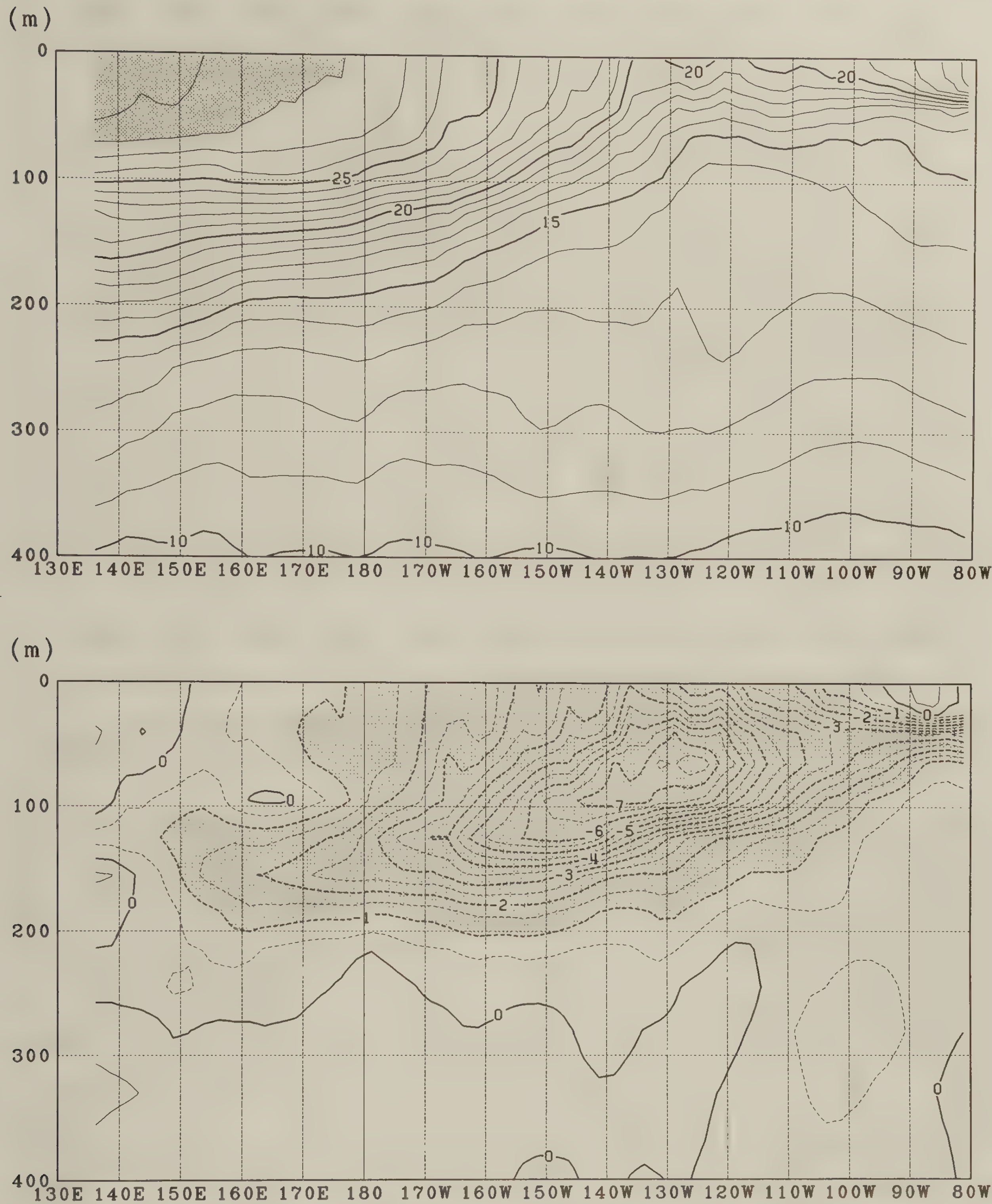
Fig.18 Subsurface (200m) temperatures in the Pacific Ocean for AUG 1998.
Contour interval is 1°C. Observation points are denoted by dots.



第19図　太平洋表層水温図(深さ400m)（1998年 8月）

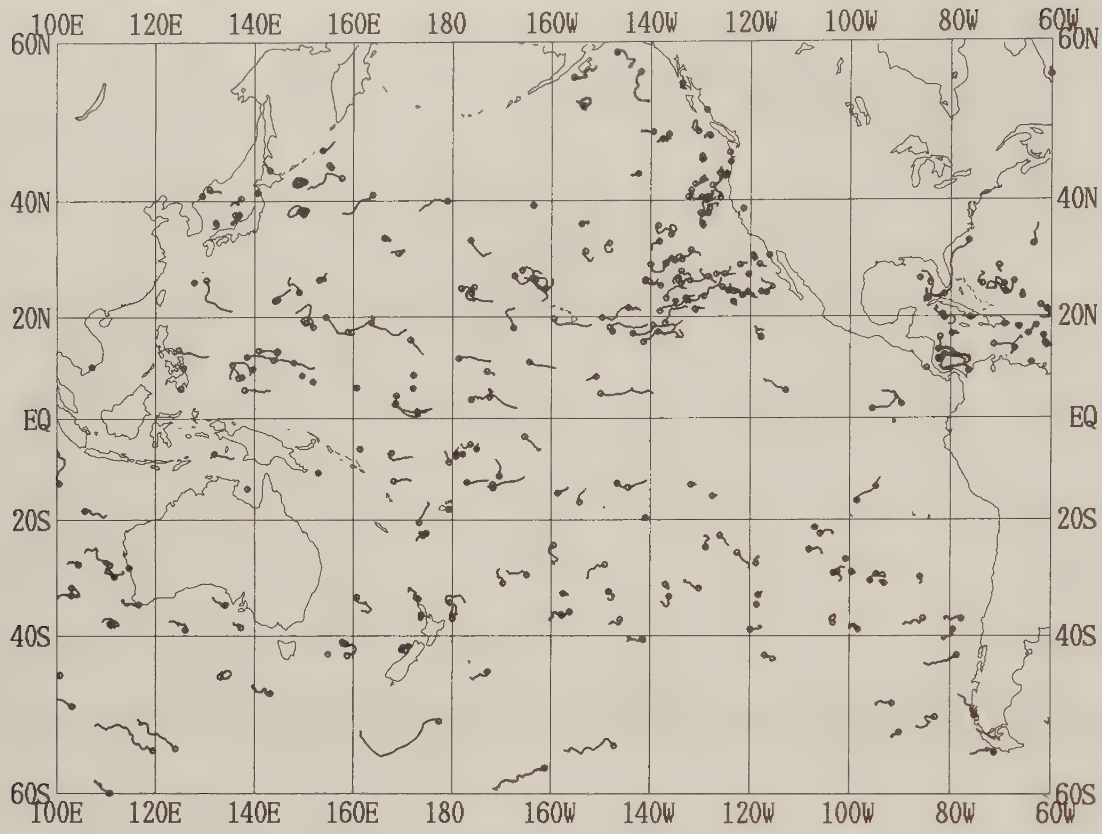
Fig.19 Subsurface (400m) temperatures in the Pacific Ocean for AUG 1998.
Contour interval is 1°C. Observation points are denoted by dots.

Depth-Longitude Sections of Equatorial Temperature & Anomalies



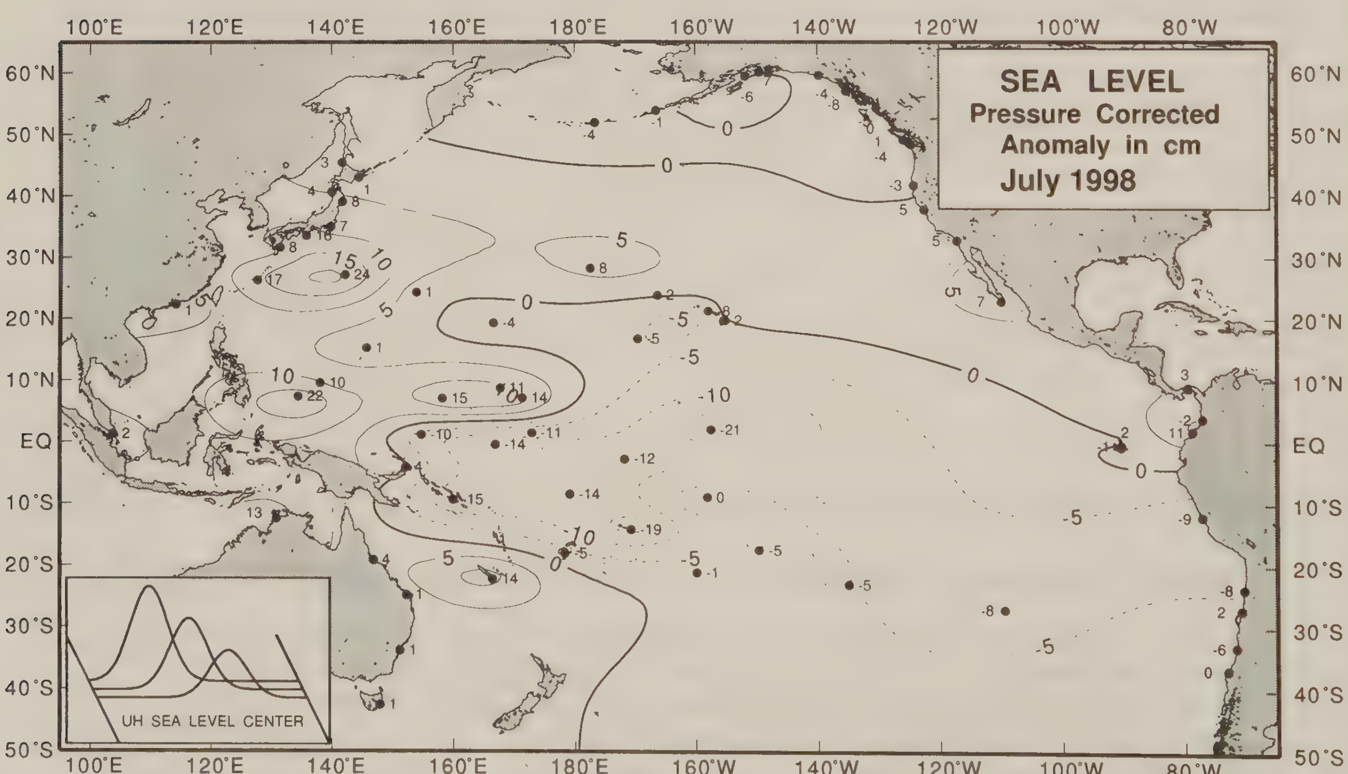
第20図　太平洋赤道に沿う表層水温（上）及び偏差（下）の深度－経度断面図（1998年 8月）

Fig.20 Depth-longitude sections of temperature (top) and anomalies (bottom) along the equator in the Pacific Ocean for AUG 1998. Data are derived from the Ocean Data Assimilation System of JMA. Contour interval is 1°C (top) and 0.5°C (bottom). Values greater than 28°C in the top panel are shaded. In the bottom panel, values greater than 1°C are shaded and values less than -1°C are spotted. Anomalies are computed from 1987-1997 base period means.



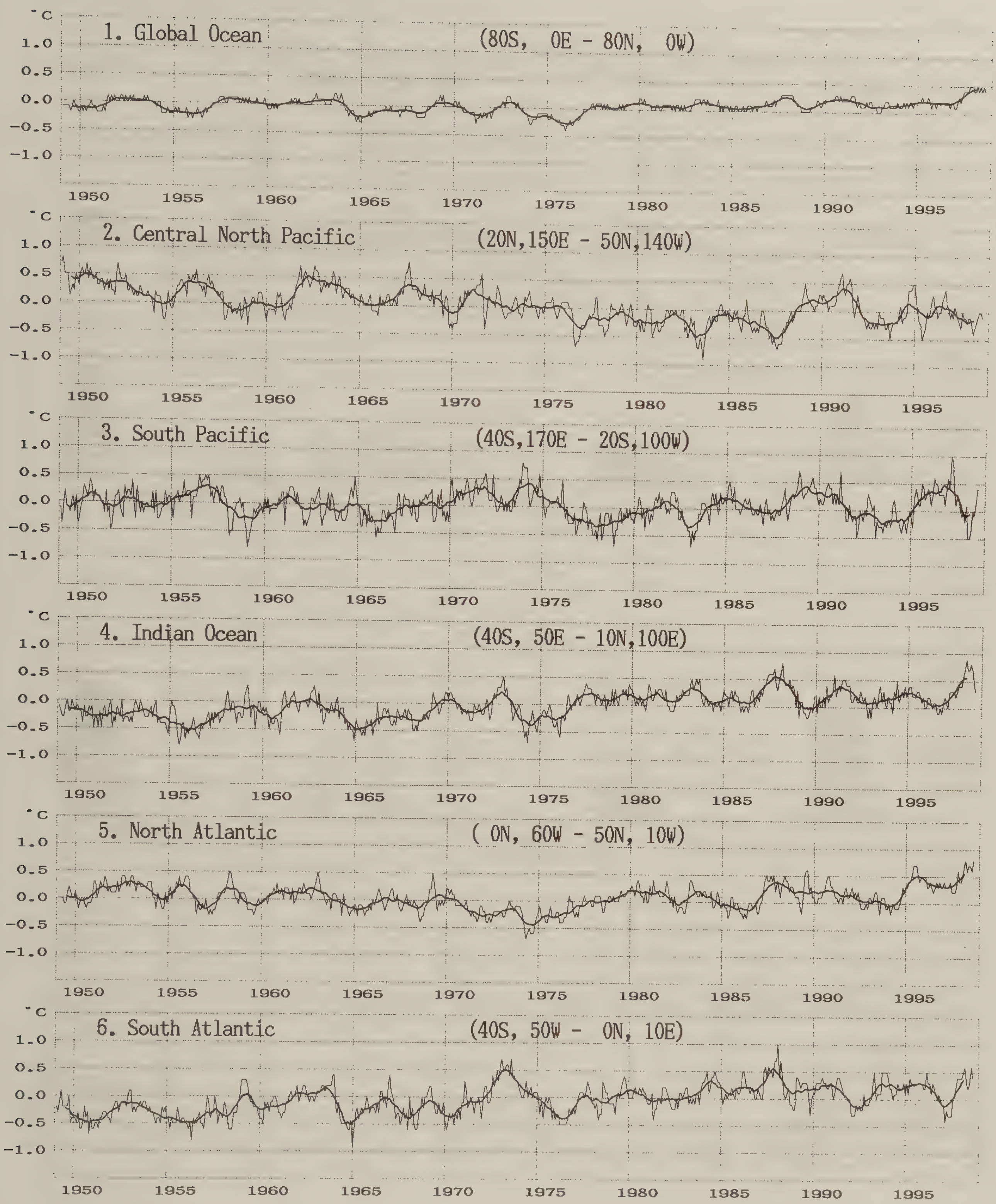
第21図　太平洋ブイ流跡図(1998年 8月)

Fig.21　Movements of drifting buoys in the Pacific Ocean during AUG 1998.
Each track is for one buoy.　Small circles represent last positions for the month.



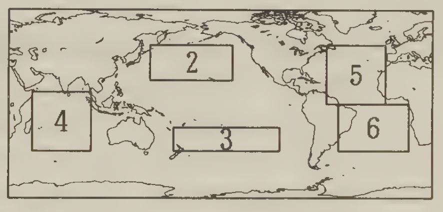
第22図　太平洋海面水位偏差図 (1998年 7月)

Fig.22　Monthly sea level anomalies for JUL 1998 obtained from mean sea level (1975-1995) adjusted for atmospheric pressure.　This figure is prepared by the SOC of ISLP-PAC, Dept. of Oceanography, Univ. of Hawaii.

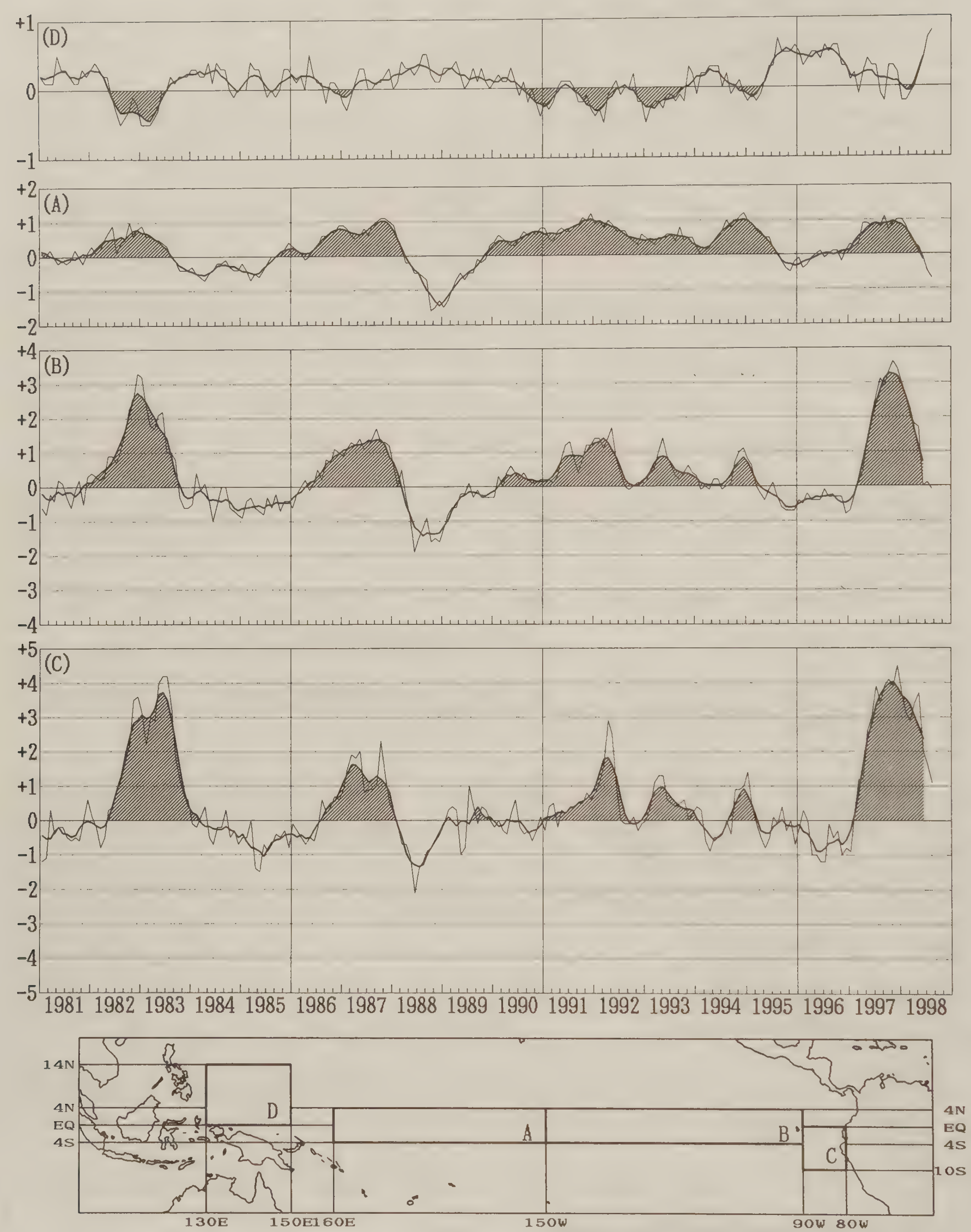


第23図 海域平均海面水温偏差の長期変動

Fig.23 Long-term variations of monthly mean sea surface temperature anomalies (°C) for the areas shown in the right panel. Anomalies are computed from the JMA climatology (1961-90). Thin lines show the monthly mean and thick lines their 13-month running means.



Time Series of Equatorial Pacific SST Anomalies



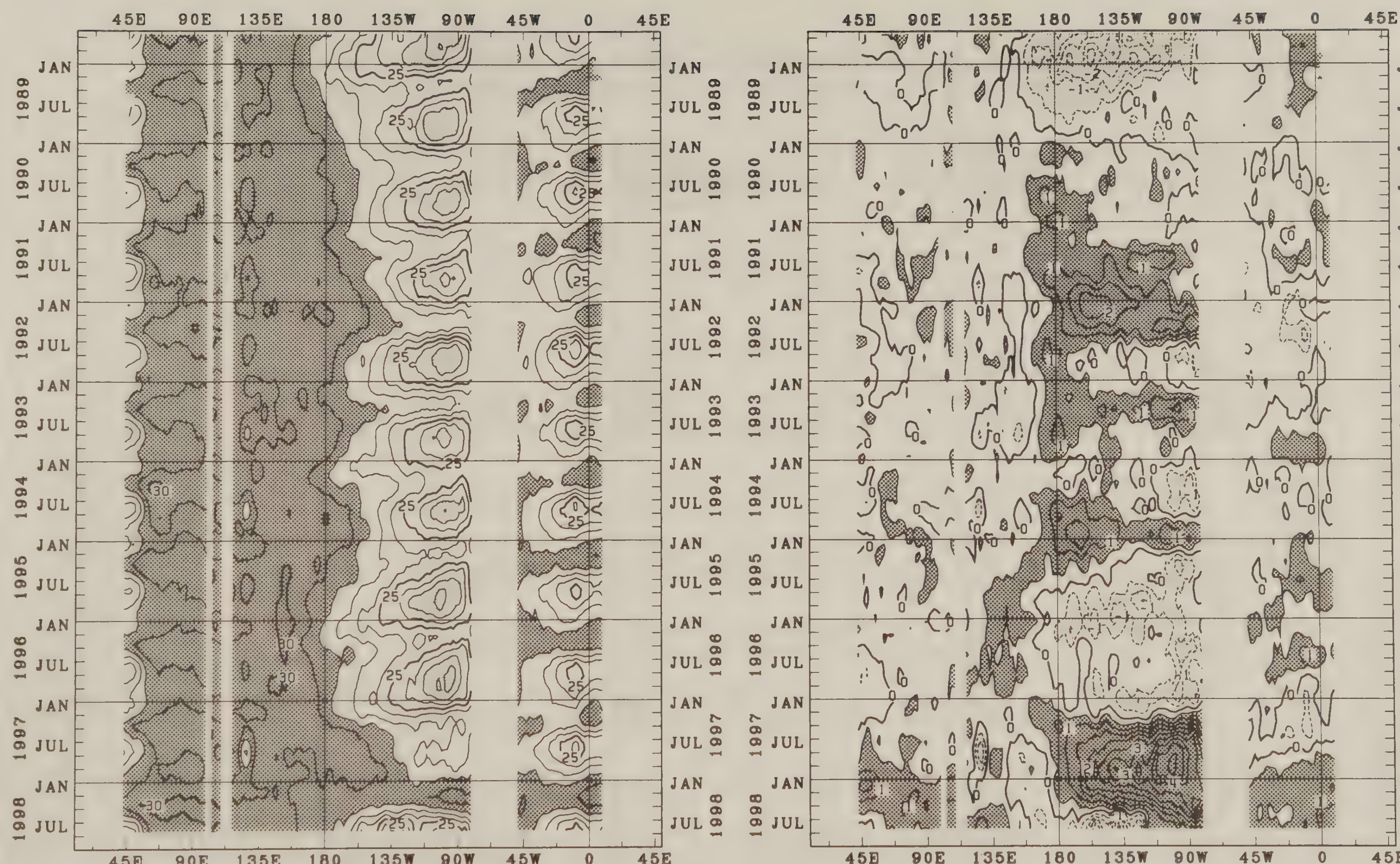
第24図　太平洋赤道域の海面水温偏差時系列図

Fig.24 Time series of monthly mean SST anomalies (°C) in the equatorial Pacific Ocean for the areas indicated at the bottom panel.
Thin lines show the monthly means and thick lines their 5-month running means.　Positive anomalies (A, B, C) and negative anomalies (D) are shaded.　Anomalies are computed from the JMA climatology (1961-1990).

	SEA SURFACE TEMPERATURE AND ANOMALY (°C)								SOI	SEA LEVEL PRESSURE ANOMALY (hPa)	
MONTH	REGION D 14N-EQ 130E-150E		REGION A 4N-4S 160E-150W		REGION B 4N-4S 150W-90W		REGION C EQ-10S 90W-80W		SOI	TAHITI 17-33S 149-37W	DARWIN 12-24S 130-52E
JAN 96	29.0	0.5	27.9	-0.1	25.0	-0.4	24.1	-0.2	0.8	1.0	-0.7
FEB 96	28.6	0.3	27.6	-0.4	25.7	-0.5	26.0	0.3	0.1	-0.2	-0.5
MAR 96	28.8	0.4	27.8	-0.3	26.7	-0.2	25.9	0.0	0.7	1.0	-0.3
APR 96	29.3	0.5	28.1	-0.1	26.7	-0.4	24.1	-1.0	0.8	0.5	-0.5
MAY 96	29.6	0.5	28.5	0.0	26.2	-0.4	22.9	-1.0	0.3	1.2	1.2
JUN 96	29.7	0.4	28.6	0.1	25.7	-0.4	21.5	-1.2	1.4	1.6	-0.2
JUL 96	29.8	0.6	28.4	-0.1	25.1	-0.1	20.4	-1.2	0.7	0.6	-0.6
AUG 96	29.6	0.5	28.4	0.0	24.3	-0.3	20.5	-0.1	0.4	0.4	-0.3
SEP 96	29.8	0.6	28.4	0.1	24.3	-0.3	19.8	-0.5	0.5	-0.7	-1.7
OCT 96	29.9	0.6	28.5	0.1	24.3	-0.3	20.4	-0.3	0.4	-0.1	-0.8
NOV 96	29.5	0.3	28.2	-0.2	24.3	-0.3	20.5	-1.0	-0.0	-0.5	-0.5
DEC 96	29.2	0.3	28.3	0.1	24.1	-0.8	21.8	-0.8	0.8	-0.3	-1.9
JAN 97	28.6	0.1	28.3	0.3	24.7	-0.7	23.4	-0.9	0.3	1.7	0.9
FEB 97	28.5	0.2	28.2	0.2	25.9	-0.3	25.9	0.2	1.2	1.0	-1.9
MAR 97	28.3	-0.1	28.4	0.3	27.0	0.1	27.1	1.2	-0.6	-0.5	0.9
APR 97	29.0	0.2	29.1	0.9	27.5	0.4	26.3	1.2	-1.1	0.4	2.3
MAY 97	29.5	0.4	29.4	0.9	27.9	1.3	26.5	2.6	-2.5	-2.1	0.9
JUN 97	29.6	0.3	29.3	0.8	28.1	2.0	25.7	3.0	-2.3	-0.8	2.1
JUL 97	29.5	0.3	29.4	0.9	27.8	2.6	25.5	3.9	-0.8	-0.1	1.2
AUG 97	29.0	-0.1	29.2	0.8	27.7	3.1	24.0	3.4	-2.0	-0.9	2.2
SEP 97	29.0	-0.2	29.4	1.1	27.5	2.9	24.2	3.9	-1.4	0.1	2.7
OCT 97	29.6	0.3	29.1	0.7	27.9	3.3	24.8	4.1	-1.6	-0.2	2.7
NOV 97	29.5	0.3	29.3	0.9	28.2	3.6	25.4	3.9	-1.2	0.4	2.7
DEC 97	29.1	0.2	29.2	1.0	28.3	3.4	27.1	4.5	-0.9	-0.5	1.1
JAN 98	28.3	-0.2	29.0	1.0	28.4	3.0	28.0	3.7	-2.3	-3.6	1.4
FEB 98	28.1	-0.2	28.8	0.8	28.8	2.6	28.8	3.1	-1.8	-0.9	3.5
MAR 98	28.3	-0.1	28.6	0.5	29.0	2.1	28.8	2.9	-2.5	-2.8	2.3
APR 98	28.8	0.0	28.5	0.3	28.9	1.8	28.5	3.4	-2.3	-1.5	1.4
MAY 98	29.3	0.2	28.7	0.2	28.3	1.7	27.6	3.7	0.0	0.4	0.5
JUN 98	29.7	0.4	28.4	-0.1	26.1	0.0	24.7	2.0	1.1	0.9	-0.5
JUL 98	29.9	0.7	28.0	-0.5	25.3	0.1	23.2	1.6	1.5	1.8	-0.6
AUG 98	29.9	0.8	27.7	-0.7	24.5	-0.1	21.7	1.1	1.0	1.4	-0.2

第1表　エルニーニョ監視指数

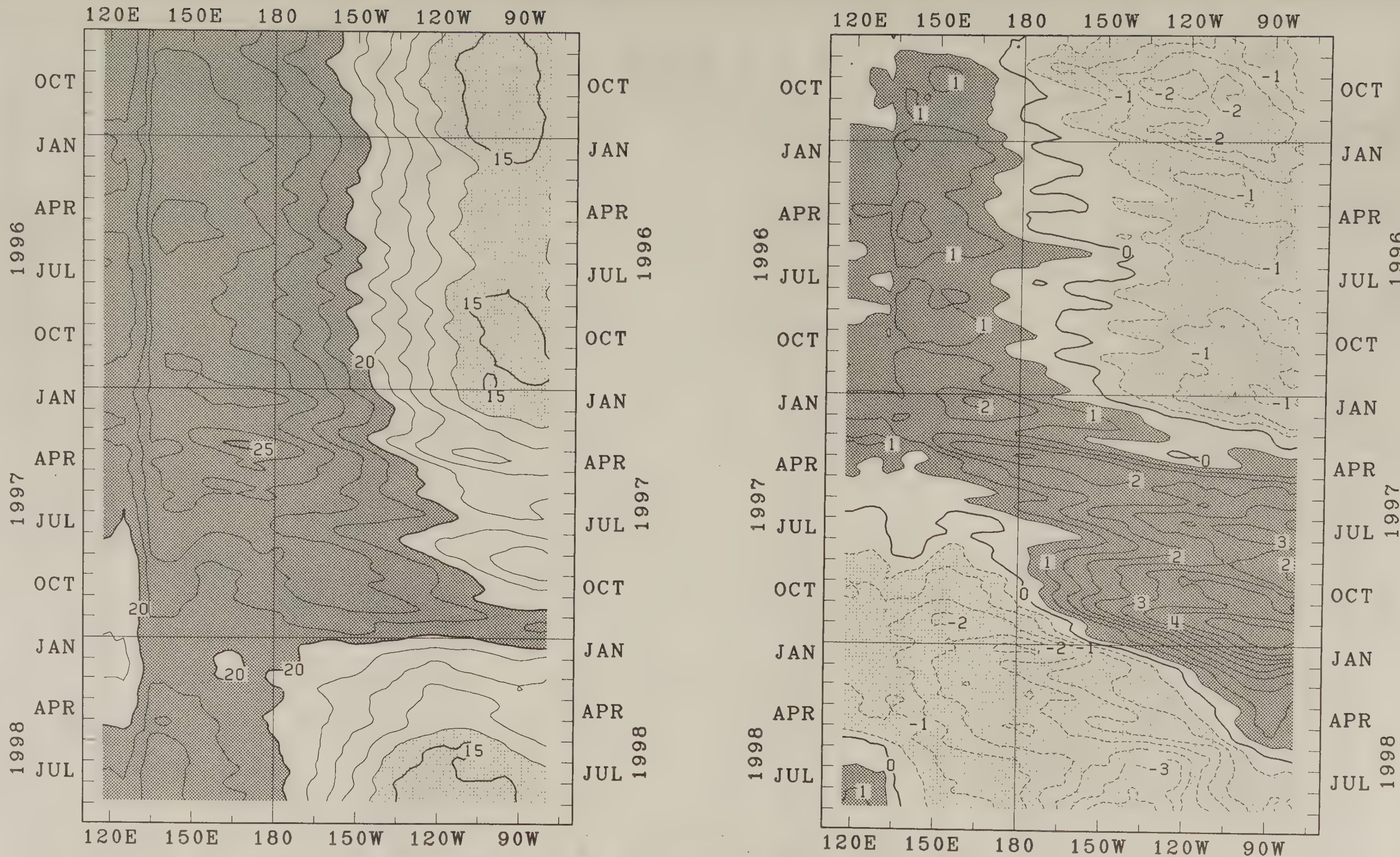
Table 1 El Nino Monitoring indices



第 25 図　赤道に沿った海面水温（左）および偏差（右）の時間-経度断面図

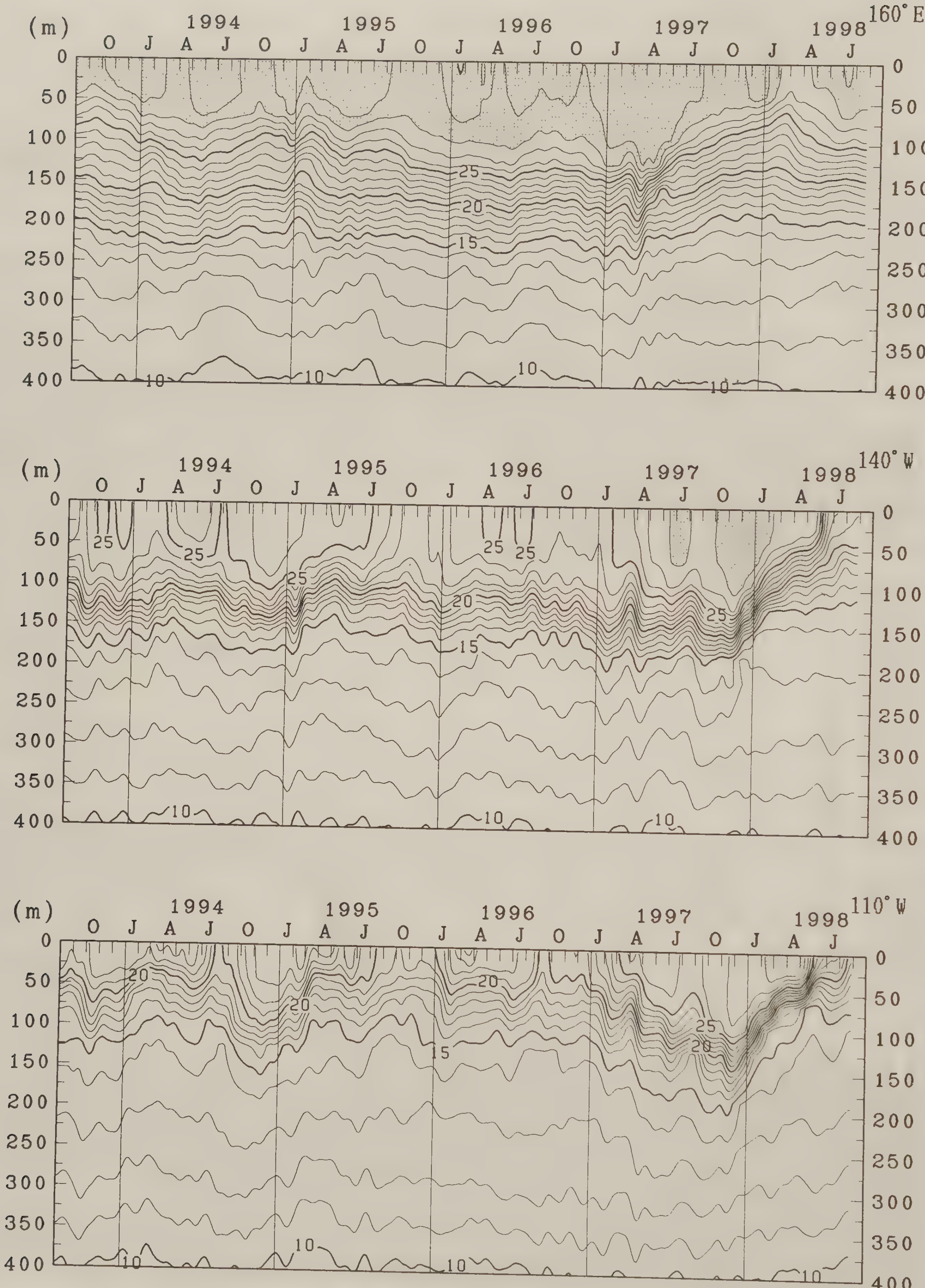
Fig.25　Time-longitude sections of SSTs (left) and anomalies (right) along the equator (2°N-2°S) in the global ocean. Contour interval is 1 °C (left) and 0.5 °C (right). Values greater than 28 °C are shaded and values less than 23 °C are spotted in the left panel. Dashed contours indicate negative anomalies in the right panel. Anomalies are computed from 1961-1990 base period means.

Time-Longitude Sections of Ocean Heat Content & Anomalies (Eq.)



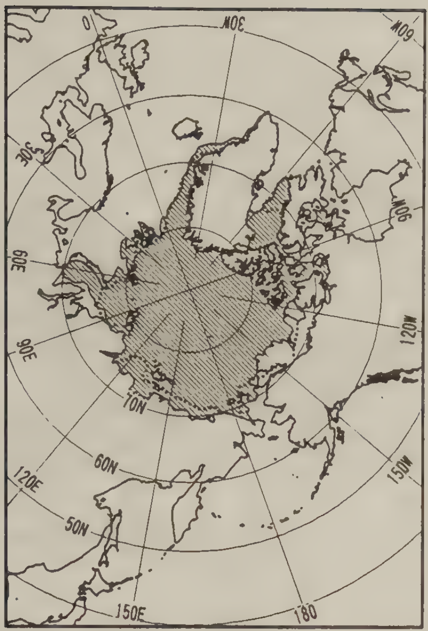
第26図　太平洋の赤道に沿う海洋表層の貯熱量（左）及び偏差（右）の時間－経度断面図

Fig.26 Time-longitude sections of ocean heat content in the upper 260m along the equator (left) and anomalies (right) in the Pacific Ocean. Data are derived from the Ocean Data Assimilation System of JMA. Contour interval is 1°C (left) and 0.5°C (right). Values greater than 20°C are shaded and values less than 16°C are spotted in the left panel. Dashed contours indicate negative anomalies in the right panel. Anomalies are computed from 1987-1997 base period means.



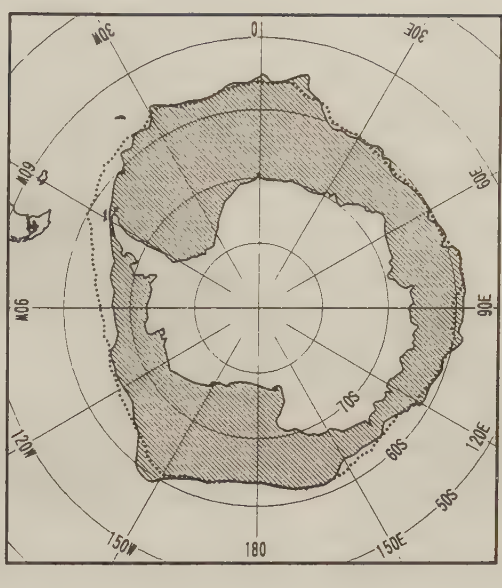
第27図　太平洋赤道域の表層水温の時間－深度断面図
（上：西部、中：中部、下：東部）

Fig.27 Time-depth sections of equatorial subsurface temperature for the western Pacific (top, 160°E), the central Pacific (middle, 140°W) and the eastern Pacific (bottom, 110°W). Data are derived from the Ocean Data Assimilation System of JMA. Contour interval is 1°C. Values greater than 28°C are shaded.



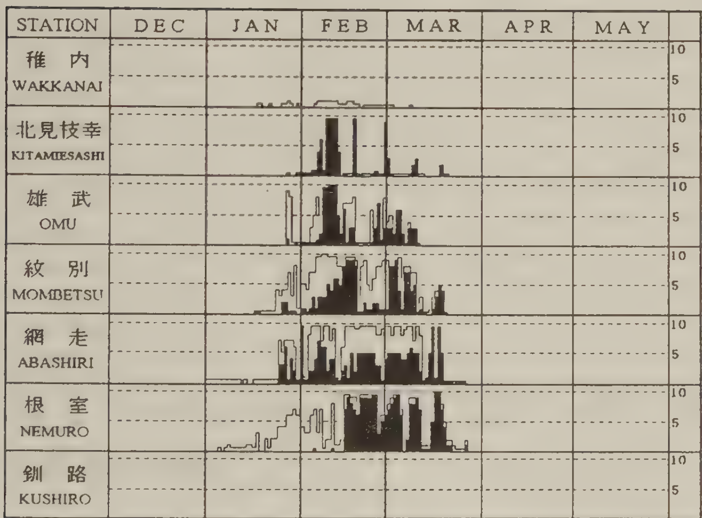
第28-1図 北極域の海氷図（1998年 8月12日）

Fig.28-1 Sea ice chart in the Arctic on 12 Aug. 1998.
The shaded area represents the sea ice extent. The dotted line denotes the mean ice edge averaged for the period from 1972 through 1990.
The data source is the National Ice Center (USA).



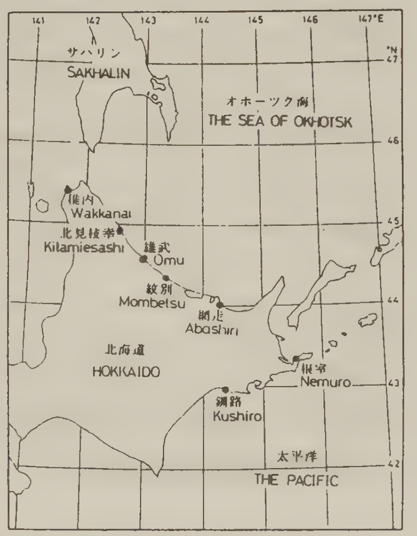
第28-2図 南極域の海氷図（1998年 8月12日）

Fig.28-2 Sea ice chart in the Antarctic on 12 Aug. 1998.
The shaded area represents the sea ice extent. The dotted line denotes the mean ice edge averaged for the period from 1973 through 1990.
The data source is the National Ice Center (USA).



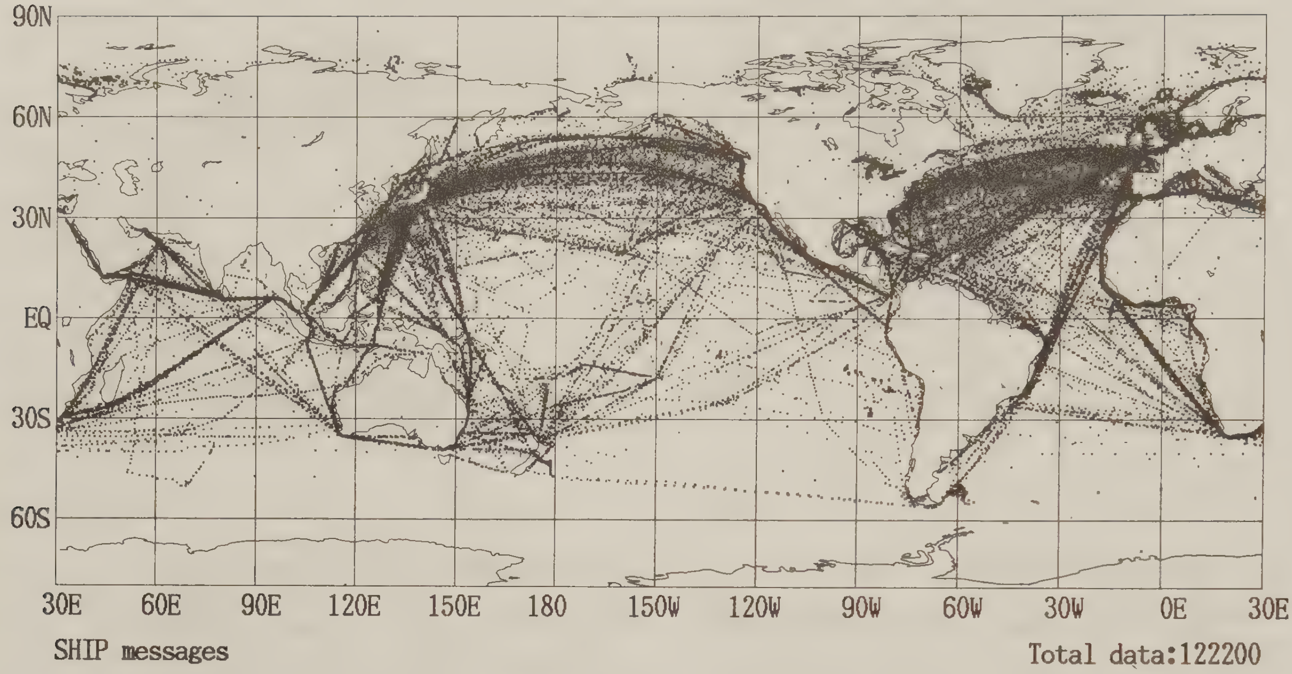
第28-3図 日々の全氷量と流氷量(1997/98)

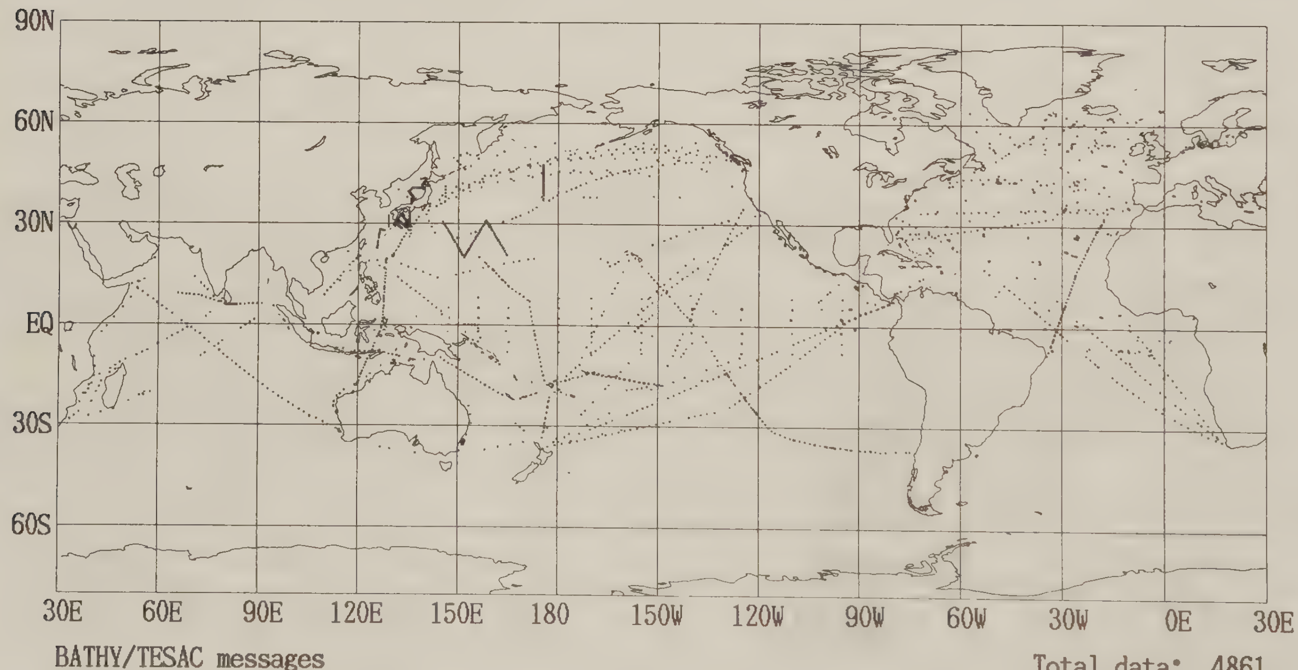
Fig. 28-3 Time series of daily amount of sea ice (1997/98)
□ : total amount of sea ice
■ : total amount of drift ice



第28-4図 沿岸海氷観測地点図

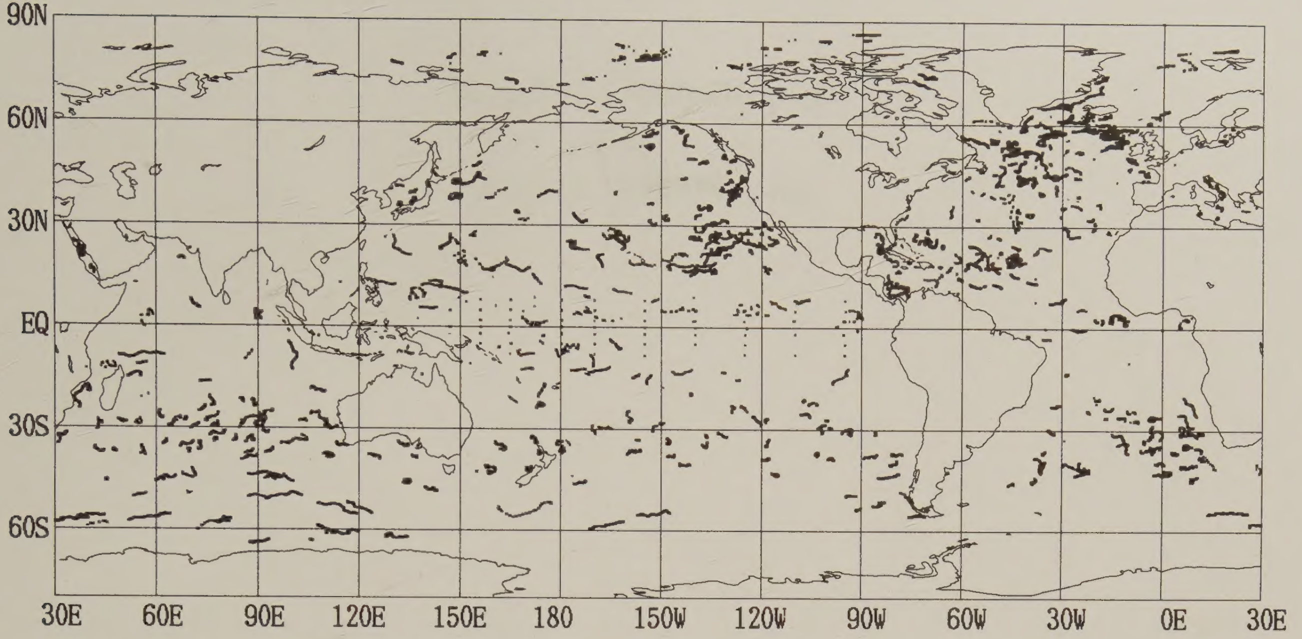
Fig. 28-4 Map of the coastal stations to observe sea ice



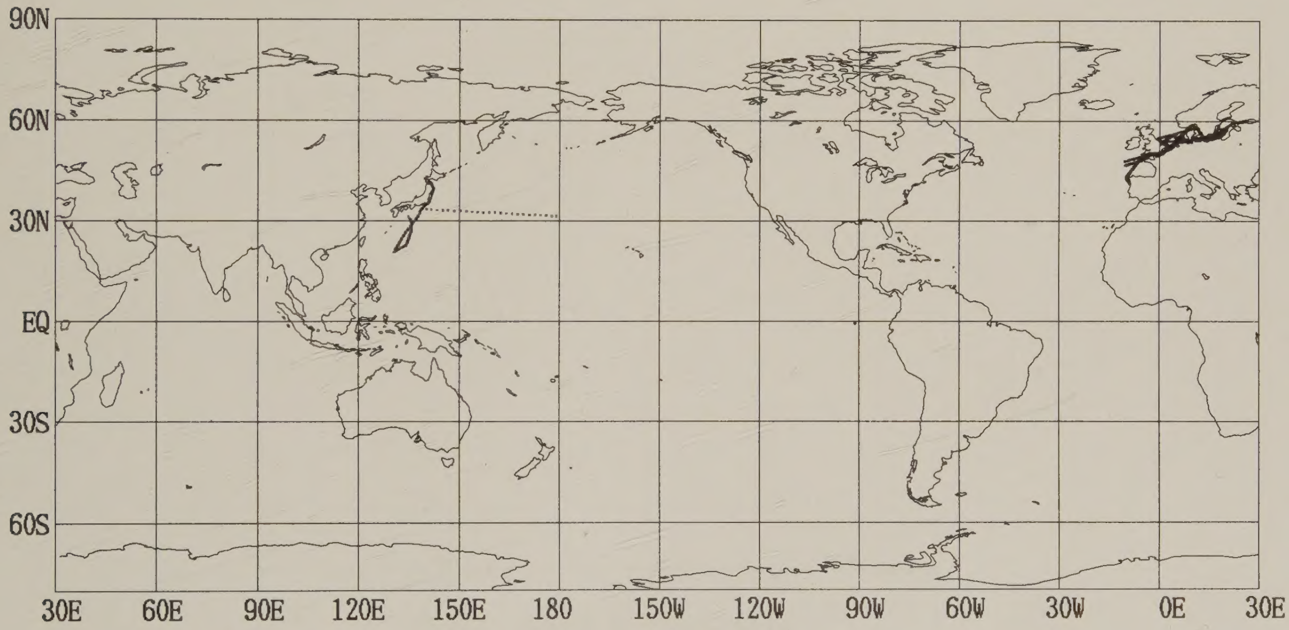


第29-1図　測点分布図(1998年 8月)

Fig.29-1 Geographical distribution of SHIP messages (SST data, top) and BATHY/TESAC messages (subsurface temperature data, bottom) for AUG 1998.



BUOY messages Total data:227093



TRACKOB messages Total data: 1873

第29-2図 測点分布図(1998年 8月)

Fig.29-2 Geographical distribution of BUOY messages (buoy drift and SST data, top) and TRACKOB messages (ship drift and SST data, bottom) for AUG 1998.

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